

EXHIBIT 1

UNITED STATES DISTRICT COURT
DISTRICT OF DELAWARE

BRIDGESTONE SPORTS CO., LTD., and
BRIDGESTONE GOLF, INC.,

Plaintiffs,

v.

ACUSHNET COMPANY,

Defendant.

Case No. 05-CA-132 (JJF)

**INVALIDITY EXPERT REPORT OF DR.
JACK KOENIG**

ACUSHNET COMPANY,

Counterclaimant,

v.

BRIDGESTONE SPORTS CO., LTD., and
BRIDGESTONE GOLF, INC.,

Counterdefendant.

TABLE OF CONTENTS

I.	INTRODUCTION	1
II.	QUALIFICATIONS/BACKGROUND.....	1
III.	MATERIALS REVIEWED AND CONSIDERED	2
IV.	PRINCIPLES OF PATENT LAW	3
V.	DISCLOSURE OF THE '961 AND '652 PATENTS.....	4
A.	'961 Patent.....	4
B.	'652 Patent.....	6
VI.	PROSECUTION HISTORY OF THE '961 AND '652 PATENTS.....	8
A.	'961 Patent Prosecution History	8
B.	'652 Patent Prosecution History	10
VII.	OPINION REGARDING THE VALIDITY OF CLAIM 1 OF THE '961 PATENT	16
A.	Preliminary Matters	17
1.	Priority of the '961 Patent	17
2.	Opinion Regarding the Level of Skill in the Art for the '961 Patent.....	17
B.	Anticipation of Claims 1 and 2 by Prior Art References.....	17
1.	U.S. Patent No. 6,612,940 to Nesbitt Anticipates Claim 1 and 2	17
i.	Claim 1	18
ii.	Claim 2	27
C.	Opinion Regarding Invalidity of Claim 2 of the '961 Patent as Obvious	32
1.	Combination of Prior Art References.....	33
i.	Nesbitt '940 in Combination with the Knowledge of One of Ordinary Skill in the Art.....	33
ii.	Wu '261 in Combination with the Knowledge of One of Ordinary Skill in the Art.....	36
iii.	Nesbitt '940 in Combination with Wu '261 and the Knowledge of One of Ordinary Skill in the Art	38
iv.	Additional Prior Art References	39
VIII.	OPINION REGARDING THE INVALIDITY OF CLAIMS 1, 5 AND 9 OF THE '652 PATENT BY PRIOR ART	41
A.	<i>Markman</i> Proceedings Related to the '652 Patent.....	41

B.	Priority Date of the '652 Patent.....	42
C.	Opinion Regarding the Level of Skill in the Art for the '652 Patent	44
D.	Anticipation of Claims 1, 5 and 9 by the Prior Art References.....	44
	1. Fujii Japanese Kokai Publication No. 02-092378	
	Anticipates Claims 1, 5, and 9.....	45
	i. Claim 1	46
	ii. Claims 3 and 5	49
	iii. Claims 6, 7 and 9.....	49
E.	Opinion Regarding Invalidity of Claims 1, 5 and 9 as Obvious.....	50
	1. Combination of Prior Art References.....	50
	i. The Fujii Reference in Combination with the Knowledge of One of Ordinary Skill in the Art	50
	ii. Tominaga '220 in Combination with The Mastication of Rubber Article and/or the Fischer '977 Patent.....	52
	A. Disclosures of the Tominaga '220 Patent	52
	B. Disclosures of the Mastication of Rubber Article.....	55
	C. Disclosures of the Fischer '977 Patent.....	58
	D. Tominaga '220 in Combination with The Mastication of Rubber Article and/or the Fischer '977 Patent Make the Asserted Claims of the '652 Patent Obvious	59
	iii. Fujii Reference in Combination with Tominaga '220.....	61
IX.	SECONDARY CONSIDERATIONS	62
X.	GRADIENTS.....	63
XI.	CONCLUSION	65

I. INTRODUCTION

1. I have been retained by the Acushnet Company ("Acushnet") to testify as an expert in this case and to review U.S. Patent Nos. 6,634,961 ("the '961 patent") and 5,252,652 ("the '652 patent").

2. I understand that Bridgestone is asserting infringement by Acushnet of claim 2 of the '961 patent, and claims 1, 5 and 9 of the '652 patent.

3. Herein, I provide my expert opinion regarding whether the asserted claims are valid in light of principles of patent law, as those principles have been explained to me.

II. QUALIFICATIONS/BACKGROUND

4. I am the Donnell Institute Professor Emeritus of the Department of Macromolecular Science and Engineering at Case Western Reserve University in Cleveland, Ohio. I received my B.A. in Chemistry and Mathematics from Yankton College and my M.S. and Ph.D. in chemistry from the University of Nebraska.

5. After receiving my Ph.D., I was employed as a research chemist in the Plastics Department at the E. I. du Pont de Nemours and Company where I developed spectroscopic methods for the characterization of polymers. In 1963, I became an assistant professor of polymer science at Case Institute of Technology and taught at Case for 42 years.

6. In research, I have been active in the development of spectroscopic techniques including infrared, Raman and NMR for the characterization of polymers including rubbers.

7. I have written a number of monographs in polymer science. My book entitled "Spectroscopy of Polymers" is now in its second edition and is widely adopted as a text for courses in polymer science and engineering.

8. Most research and development work depends on the development of structure-property relationships. I have played a significant role over my 42 years of research in developing spectroscopic methods to provide fundamental structure-property relationships for polymers used in thermoplastic and thermoset polymer systems including plastics, coatings, adhesives, rubbers and composites.

9. I have extensive experience in the characterization of rubber, including polybutadiene rubber. I am currently in the process of working with Sumitomo Corporation on a confidential project involving the characterization of polybutadiene rubber for use in golf balls.

10. In 2000, I published a research article based on FTIR imaging of polybutadiene (S.J. Oh and J.L. Koenig, Rubber Chem. & Tech., 73 #1, 74-79 (2000). "Studies of Peroxide Curing of Polybutadiene/Zinc Diacrylate Blends By Fast FT-IR Imaging."

11. A copy of my *curriculum vitae*, including a list of my publications, is attached as Exhibit A.¹

III. MATERIALS REVIEWED AND CONSIDERED

12. A list of the materials I reviewed and considered in the preparation of this report may be found at Exhibit B. I have also relied on my professional and educational experience in the field of rubber chemistry, as outlined above.

¹ I am being compensated \$400/hr for the time spent in preparing my study and for testifying.

IV. PRINCIPLES OF PATENT LAW

13. While I am not a lawyer, I have been informed of some basic legal principles, which I have used to perform the analysis found in this report.

14. I understand that the patent laws provide rules as to what constitutes prior art. For instance, I have been informed that if a printed publication is published, or a U.S. patent is issued, or the invention was publicly used, more than one year before the filing of an application, that reference is prior art.

15. I also have been informed that an issued U.S. patent, filed before the filing date of the application in question, but issued after the filing date of the application in question, is also. I understand that the patent statutes provide for other definitions of prior art.

16. I have been informed that a person is not entitled to a patent if the claimed invention was described in a printed publication, was patented, was publicly used, or was known to others prior to the invention of the claimed subject matter.

17. I understand that a claim is invalid as "anticipated" if a single prior art reference teaches each and every limitation of the claim, either expressly or inherently.

18. I understand that an inherent limitation is one that is necessarily present.

19. I also understand that, even though not anticipated, a claim may still be rendered invalid if the claim was obvious in view of the prior art.

20. In determining whether a claim was obvious, I understand an inquiry into the following factors is proper:

- a. The scope and content of the prior art;
- b. The level of ordinary skill in the art;
- c. The differences between the claimed invention and the prior art;

- d. Whether the differences are such that the claimed invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made; and
- e. Whether secondary considerations exist, such as long-felt but unresolved need, failure of others, commercial success, licensing, copying, etc., and, if so, whether there is a nexus between the secondary consideration and the claimed invention.

21. I have considered the above criteria in performing my analysis and forming my opinions found in this report.

22. I understand that under U.S. patent laws, issued patents are presumed valid, but that presumption can be rebutted. I further understand that the presumption of validity is more easily overcome where the evidence consists of uncited material prior art not considered by the Examiner during prosecution.

23. I also understand that when reviewing the validity of a claim, the analysis is to be performed from the perspective of one of ordinary skill in the art.

24. I understand that a U.S. patent application may claim the benefit of an earlier filing date of a foreign application(s). To obtain this benefit, certain rules must be followed, one of which, as I understand it, is that the foreign patent application must contain a written description of the invention, and of the manner and process of making and using the invention, in such full, clear, concise, and exact terms as to enable any person skilled in art to which it pertains to make and to use the full scope of the invention as claimed.

V. DISCLOSURE OF THE '961 AND '652 PATENTS

A. '961 Patent

25. The '961 patent relates to multi-piece golf balls that include a solid core molded from a rubber composition comprising at least one base rubber having specific

material properties, an unsaturated carboxylic acid, an organosulfur compound, an inorganic filler, and an organic peroxide.

26. The '961 patent further relates to multi-piece golf balls in which the solid core is covered by an inner cover layer that is harder in comparison to the outer cover.

27. The '961 patent describes its subject matter as follows:

The inventor has discovered that golf balls having a solid core, an inner cover layer over the cover, and an outer cover layer over the inner cover layer, wherein the solid core is made of a rubber composition formulated from a particular type of base rubber combined in specific proportions with certain other materials, and the outer cover layer is softer than the inner cover layer, exhibit a good synergy from optimization of the solid core materials and an appropriate distribution of hardness between the inner and outer cover layers. Multi-piece solid golf balls thus constituted have a good, soft feel when hit with a golf club and an excellent spin performance that enables the ball to travel further when played. ('961, col. 2, lines 4-16.)

28. The '961 patent asserts that a golf ball including these properties gives a "good, soft feel upon impact and an excellent spin performance that makes it possible to achieve an increased distance." (col. 1, lines 5-9; col. 1, line 66-col. 2, line 3.)

29. Bridgestone accuses Acushnet of infringing claim 2 of the '961 patent. Because claim 2 depends from claim 1, I have reviewed the validity of both claim 1 and 2.

30. Claim 1 of the '961 patent reads:

A multi-piece solid golf ball comprising a solid core, an inner cover layer and an outer cover layer, wherein the solid core is molded from a rubber composition comprising 100 parts by weight of a base rubber composed of (a) 20 to 100 wt % of a polybutadiene having a cis-1, 4 content of at least 60% and 1,2 vinyl content of at most 2%, having a viscosity η at 25° C. as a 5 wt % solution in toluene of up to 600 mPa's, being synthesized using a rare-earth catalyst and satisfying the relationship: $10B + 5 \leq A \leq 10B + 60$,

wherein A is the Mooney viscosity ($ML_{1+4}(100^{\circ}C.)$) of the polybutadiene and B is the ratio Mw/Mn between the weight-average molecular weight Mw and the number-average molecular weight Mn of the polybutadiene, in combination with (b) 0 to 80 wt % of a diene rubber other than component (a), (c) 10 to 60 parts by weight of an unsaturated carboxylic acid or a metal salt thereof or both, (d) 0.1 to 5 parts by weight of an organosulfur compound, (e) 5 to 80 parts by weight of an inorganic filler, (f) 0.1 to 5 parts by weight of an organic peroxide; the inner cover layer has a Shore D hardness of 50 to 80; the outer cover layer has a Shore D hardness of 35 to 60; and the outer cover layer has a lower Shore D hardness than the inner cover layer.

31. Claim 2 of the '961 patent reads:

The golf ball of claim 1, wherein the diene rubber (b) includes 30 to 100 wt % of a second polybutadiene which has a cis-1, 4 content of at least 60% and a 1,2 vinyl content of at most 5%, has a Mooney viscosity ($ML_{1+4}(100^{\circ}C.)$) of note more than 55, and satisfies the relationship:

$\eta \leq 20A - 550$, wherein A is the Mooney viscosity ($ML_{1+4}(100^{\circ}C.)$) of the second polybutadiene and η is the viscosity of the second polybutadiene, in mPa's, at $25^{\circ}C.$ as a 5 wt % solution in toluene.

32. A copy of the '961 patent is attached to this report as Exhibit C.

B. '652 Patent

33. The '652 patent allegedly relates to improving one-piece and multi-layered golf balls by forming a golf ball core from a rubber composition comprising a base rubber, an unsaturated carboxylic acid metal salt, an organic sulfur compound and/or a metal salt thereof, and an organic peroxide. The organosulfur compounds that are described in the '652 patent include thiophenols, including pentachlorothiophenol (PCTP) and metal salts thereof. (Ex. D'652, col. 2, lines 52-65.) The inventors indicated that there was a preferred range for the effective amount of organosulfur compounds:

“[t]he sulfur compound is preferably blended in amounts from about 0.05 to about 2 parts by weight, more preferably about 0.1 to about 0.5 parts by weight per 100 parts by weight of base rubber.” (Ex. D, col. 2, line 66-col. 3, line 2.)

34. The '652 patent describes its content as follows:

Searching for an optimum additive for a rubber composition containing a base rubber, typically polybutadiene and an unsaturated carboxylic acid metal salt as a co-crosslinking agent, the inventors have found that when an organic sulfur compound and/or a metal-containing organic sulfur compound is added to the rubber composition, there is obtained a rubber composition which can be vulcanized into a rubbery elastomer having improved rebound resilience. If a one piece golf ball or a multi-layered golf ball core is formed from this rubber composition, the resulting solid golf ball exhibits an increased initial velocity upon hitting and improved flying performance. (Ex. D, '652, col. 1, lines 44-57.)

35. Bridgestone accuses Acushnet of infringing claims 1, 5 and 9 of the '652 patent. Claim 1 is an independent claim. Claims 5 and 9 are dependent claims. Claim 5 depends on claim 3, which depends on claim 1. Claim 9 depends on claim 7, which depends on claim 6, which depends on claim 1. Therefore, I have reviewed the validity of claims 1, 3, 5, 6, 7 and 9.

36. Claim 1 of the '652 patent reads:

A solid golf ball, having an improved rebound property and initial velocity, comprising a rubber composition containing 100 parts by weight of a base rubber selected from the group consisting of polybutadiene rubber, natural rubber, polysioprene rubber and styrene-butadiene rubber, about 25 to about 40 parts by weight of a zinc or magnesium salt of an unsaturated fatty acid having 3 to 8 carbon atoms, about 0.05 to about 2 parts by weight of a sulfur compound selected from the group consisting of pentachlorothiophenol, 4-t-butyl-o-thiocresol, 4-t-butyl-p-thiocresol, 2-benzamidothiophenol, thiobenzoic acid, and zinc salts thereof, and about 0.5 to about 3 parts by weight of an organic peroxide.

37. Claim 3 of the '652 patent reads:

The solid gold ball of claim 1, wherein said solid golf ball core and a cover enclosing the core, and said core is formed of said rubber composition.

38. Claim 5 of the '652 patent reads:

The solid gold ball of claim 3, wherein said solid golf ball further comprises an intermediate layer between the core and the cover.

39. Claim 6 of the '652 patent reads:

The solid golf ball of claim 1, wherein said base rubber is a polybutadiene rubber.

40. Claim 7 of the '652 patent reads:

The solid gold ball of claim 6, wherein said polybutadiene rubber is a poly(1,4-butadiene) rubber containing at least 40 mol % of cis-1, 4 bond.

41. Claim 9 of the '652 patent reads:

The solid golf ball of claim 7, wherein said base rubber comprises at least 80% by weight of said poly(1,4-butadiene) rubber.

42. A copy of the '652 patent is attached to this report as Exhibit D.

VI. PROSECUTION HISTORY OF THE '961 AND '652 PATENTS

43. The following is my understanding of the history of the patent applications that led to the '961 and '652 patents.

A. '961 Patent Prosecution History

44. The '961 patent, entitled "Multi-Piece Solid Golf Ball," was filed in the United States Patent and Trademark Office on May 30, 2002, claiming priority to Japanese patent application no. 2001-163238, filed May 30, 2001 in Japan.

45. During prosecution, the applicants initially claimed a multi-piece solid golf ball with no requirement for a rare-earth catalyst to synthesize the base rubber of the core. In addition, the claims did not set forth requirements regarding the hardness values of the inner and outer cover layers. As originally filed, claim 1 read as follows:

A multi-piece solid golf ball comprising a solid core, an inner cover layer and an outer cover layer, wherein the solid core is molded from a rubber composition comprising 100 parts by weight of a base rubber composed of (a) 20 to 100 wt % of a polybutadiene having a cis 1,4 content of at least 60% and a 1,2 vinyl content of at most 2%, having a viscosity η at 25°C as a 5 wt% solution in toluene of up to 600 mPa·s, and satisfying the relationship: $10B + 5 \leq A \leq 10B + 60$, wherein A is the Mooney viscosity (ML_{1+4} (100°C)) of the polybutadiene and B is the ratio M_w/M_n between the weight average molecular weight M_w and the number-average molecular weight M_n of the polybutadiene, in combination with (b) 0 to 80 wt% of a diene rubber other than competent (a),

(c) 10 to 60 parts by weight of an unsaturated carboxylic acid or a metal salt thereof or both,

(d) 0.1 to 5 parts by weight of an organosulfur compound,

(e) 5 to 80 parts by weight of an inorganic filler, and

(f) 0.1 to 5 parts by weight of an organic peroxide; and

the outer cover layer has a lower Shore D hardness than the inner cover layer.

(Ex. E, '961 Prosecution History, at original claim 1).

46. The Examiner rejected the pending claims for obviousness-type double patenting over U.S. Patent Application Serial Numbers 10/156,184 and 10/157,492 in view of an article from Science and Golf III at page 413. Additionally, the claims were rejected as being obvious over U.S. Patent No. 6,194,505 in view of U.S. Patent No. 5,252,652. Claim 5 was rejected over these two U.S. Patents further in view of the Science and Golf III article. (Ex. E, Office Action).

47. In responding to the office action, Bridgestone amended claim 1 as follows:

A multi-piece solid golf ball comprising a solid core, an inner cover layer and an outer cover layer, wherein the solid core is molded from a rubber composition comprising 100 parts by weight of a base rubber composed of (a) 20 to 100 wt % of a polybutadiene having a cis 1,4 content of at least 60% and a 1,2 vinyl content of at most 2%, having a viscosity η at 25°C as a 5 wt% solution in toluene of up to 600 mPa·s, being synthesized using a rare-earth catalyst and satisfying the relationship: $10B + 5 \leq A \leq 10B + 60$, wherein A is the Mooney viscosity (ML_{1+4} (100°C)) of the polybutadiene and B is the ratio M_w/M_n between the weight average molecular weight M_w and the number-average molecular weight M_n of the polybutadiene, in combination with (b) 0 to 80 wt% of a diene rubber other than competent (a),

(c) 10 to 60 parts by weight of an unsaturated carboxylic acid or a metal salt thereof or both,

(d) 0.1 to 5 parts by weight of an organosulfur compound,

(e) 5 to 80 parts by weight of an inorganic filler, and

(f) 0.1 to 5 parts by weight of an organic peroxide;

the inner cover layer has a Shore D hardness of 50 to 80;

the outer cover layer has a Shore D hardness of 35 to 60;
and

the outer cover layer has a lower Shore D hardness than the inner cover layer.

(Ex. E, Amendment).

48. Following this response, the Examiner allowed the application without comment. (Ex. E, Notice of Allowance and Issue Fees Due, 5/13/2003).

B. '652 Patent Prosecution History

49. The '652 patent, entitled "Solid Golf Balls," was filed in the United States Patent and Trademark Office on May 10, 1990, claiming priority to Japanese patent application no. 2001-119460, filed November 5, 1989.

50. The prosecution history of the '652 patent is long and complex. (Ex. F., '652 Prosecution History). During prosecution, the applicants initially attempted to claim a solid golf ball with a base rubber, a crosslinker, and a sulfur compound selected from the group consisting of organic sulfur compounds or metal-containing organic sulfur compounds. As originally filed, claim 1 read as follows:

A solid golf ball comprising a rubber composition containing a base rubber, an unsaturated carboxylic acid metal salt, and a sulfur compound selected from the group consisting of an organic sulfur compound and a metal-containing organic sulfur compound. (Ex. F, at original claim 1).

51. The claims did not originally recite specific types of organic sulfur and metal-containing organic sulfur compounds, nor did they include an organic peroxide. (*Id.*)

52. On December 12, 1990, the examiner rejected all claims as failing to satisfy the first and second paragraphs of section 112. (Ex. F, Office Action of 12/12/90 at 2). The Examiner felt that the advantages of the invention could not be obtained unless the rubber disclosed in the specification was used. Particularly, the Examiner pointed out that "[I]t is seen that the performance in the claimed solid golf ball made with the recited ingredients could not be predicted if the rubber used in the golf ball composition were, for example, a polyurethane elastomer." (*Id.*)

53. The Examiner also rejected claims 1 and 3-6 under 35 U.S.C. § 103(a) over U.S. Patent No. 4,770,422 to Isaac ("Isaac '422"). The Examiner opined that because claim 1 did not claim the amount of organosulfur compound that is used in the golf ball, it would have been obvious to add a negligible amount of organosulfur compound. (Ex. F, Office Action of 12/12/90 at 4).

54. In response to this rejection, Bridgestone presented the following claim:

A solid golf ball comprising a rubber composition containing 100 parts by weight of a base rubber selected from the group consisting of polybutadiene rubber, natural rubber, polyisoprene rubber and styrene butadiene rubber, about 25 to about 40 parts by weight of an unsaturated carboxylic acid metal salt, and about 0.05 to about 2 parts by weight of a sulfur compound selected from the group consisting of an organic sulfur compound and a metal-containing organic sulfur compound, and about 0.5 to about 3 parts by weight of an organic peroxide.

(Ex. F, Amendment of 4/12/91).

55. Bridgestone also submitted the declaration of Mr. Egashira, in an attempt to demonstrate that various organic sulfur compounds can give improved velocity. (Ex. F, Decl. of Yoshinori Egashira, 3/25/91). In this declaration, at p. 3, the following table was presented:

Table 1

	No. 1	No. 2	No. 3	No. 4
Core composition (pbw)				
Poly(cis-1,4-butadiene) rubber	100	100	100	100
Zinc acrylate	32	32	32	32
Zinc Oxide	21	21	21	21
Antioxidant	0.2	0.2	0.2	0.2
Dicumyl peroxide	1.5	1.5	1.5	1.5
Pentachlorothiophenol zinc salt	0.2	—	—	—
2-benzamidothiophenol	—	0.2	—	—
Thiobenzoic acid	—	—	0.2	—
Pentachlorothiophenol	—	—	—	0.2
Ball properties				
Weight, g	45.3	45.3	45.3	45.3
Hardness	2.30	2.38	2.40	2.28
Initial velocity, m/sec.	73.37	73.10	73.05	73.32

56. Bridgestone further argued that Isaac '422 did not disclose or suggest an organic sulfur compound or a metal-containing sulfur compound and, thus, obviousness was not shown. (*Id.* at pp. 8-9). At this time new claims 7-20 were added. (*Id.* at pp. 2-4).

57. After considering this response, the Examiner rejected claims 1 and 3-20 as being obvious over either Isaac '422 or U.S. Patent No. 4,683,257 to Kakiuchi et al. ("Kakiuchi '257") in view of U.S. Patent No. 4,556,220 to Tominaga ("Tominaga '220"). (Ex. F, Office Action of 07/08/1991 at 2). Additionally, the Examiner rejected claims 1 and 3-20 under § 102(b) as being anticipated by Tominaga '220. (*Id.* at pp. 2-3). The Examiner indicated that the Tominaga '220 reference disclosed all of the claimed features, including the presence of a "polysulfide compound." (*Id.* at 2).

58. In response to this rejection, Bridgestone once again amended claim 1 by replacing the term "organic sulfur compound" with "thiophenols and metal salts thereof, and thiocarboxylic acids and metal salts thereof." (Ex. F, Amendment of 10/08/1991 at 1). Bridgestone argued that Tominaga '220 disclosed only specific sulfur compounds, and not those sulfur compounds being claimed in the '652 patent. (*Id.* at 4).

59. Bridgestone also asserted that "[a]n essential aspect of the present invention is the incorporation of a specific sulfur compound as recited in Applicant's amended claim 1." (*Id.* at 5). The Declaration filed with the previous response was again used to demonstrate the "unexpectedly superior results" that were achieved using these specific sulfur compounds. (*Id.*) Claims 13 and 16 were cancelled at this time.

60. After considering these arguments, the Examiner issued a final rejection asserting that claims 1, 3-12, 14-15 and 17-20 were obvious over any one of Tominaga

'220, Isaac '422 or Kakiuchi '257 in view of U.S. Patent No. 2,467,789 to Verbanc et al. ("Verbanc '789"). (Ex. F, Office Action of 12/11/1991 at 2).

61. The Examiner explained that Verbanc '789 teaches "the processability of elastomers (e.g., polybutadiene) is improved when a zinc salt of an aromatic mercaptan of the benzene and naphthalene series is incorporated into elastomers." (*Id.* at 2-3).

62. In responding to this office action, Bridgestone argued that the Verbanc '789 reference failed to disclose: (1) the use of the specific sulfur compounds being claimed; and (2) the use of an unsaturated carboxylic acid metal salt. (Ex. F, Amendment under 37 C.F.R. § 116 of 04/13/1992 at 5-6).

63. Bridgestone also submitted another declaration of Mr. Egashira. Mr. Egashira indicated that tests were performed to compare the rebound properties of a ball formed of a rubber composition with a zinc salt of pentachlorothiophenol with and without zinc acrylate, to demonstrate the importance of Verbanc's lack of disclosure of an unsaturated carboxylic acid metal salt. (Ex. F, Egashira Decl. of 04/06/1992 at 3).

64. Bridgestone stated that the data presented in Mr. Egashira's declaration "illustrates the unexpectedly superior results achieved by the present invention, in particular with respect to improved initial velocity, rebound property, deflection under load and hardness." (*Id.* at 6).

65. Following the response filed by Bridgestone, the Examiner withdrew the finality of the office action and the previous rejection. The Examiner issued a new rejection, concluding that claims 1, 3-12, 14-15 and 17-20 (all claims then pending) were obvious over any one of Tominaga '220, Isaac '422, or Kakiuchi '257 in view of U.S. Patent No. 4,129,538 to Kaplan et al. ("Kaplan '538"). After noting that the primary

references failed to disclose pentachlorothiophenol, the Examiner stated that Kaplan taught that "the processability of elastomers (e.g., polybutadiene) is improved when an iron-free peptizer such as pentachlorothiophenol is incorporated into said elastomers." (Ex. F, Office Action of 5/5/92 at 3).

66. In response to this rejection, Bridgestone argued that Kaplan does not teach or suggest the inclusion of an organic peroxide in the rubber composition and also does not teach or appreciate the art of golf balls. (Ex. F, Amendment of 08/05/1992 at 3).

67. Bridgestone also filed another declaration from Mr. Egashira. (Ex. F, Egashira Decl. of 7/24/92). In this declaration, Mr. Egashira purportedly demonstrated that core compositions with no zinc acrylate or, in the alternative, no organic peroxide, produce inferior ball properties. (Ex. F, Egashira Decl. (7/24/92) at 3).

68. The Examiner did not accept Bridgestone's position and maintained the previous rejection. The Examiner stated in the following office action that:

Given the benefit that all prior art relied upon, the ordinary practitioner in the rubber art would have found clear incentive to employ the pentachlorothiophenol peptizing agent of Kaplan et al. into a styrene-butadiene rubber composition for the purpose of breaking down the rubber prior to its compounding or vulcanization. The lower resulting viscosity facilitates the compounding process[.] Hence the ordinary practitioner of this art would have found clear incentive to subject the styrene/butadiene rubber to just such a peptizing process prior to compounding with additional organic peroxide and unsaturated carboxylic acid metal salt as taught by the primary references. (Ex. F, Office Action of 10/13/92 at 2-3).

69. Bridgestone then amended claim 1 to include the stated objective of the invention, *i.e.*, an improved rebound property and initial velocity, as well as to recite the

specific unsaturated fatty acids and sulfur compounds for inclusion in the rubber compositions:

A solid golf ball, having an improved rebound property and initial velocity, comprising a rubber composition containing 100 parts by weight of a base rubber selected from the group consisting of polybutadiene rubber, natural rubber, polyisoprene rubber and styrene-butadiene rubber, about 25 to about 40 parts by weight of a zinc or magnesium salt of an unsaturated carboxylic fatty acid having 3 to 8 carbon atoms [metal salt], about 0.05 to about 2 parts by weight of a sulfur compound selected from the group consisting of pentachlorothiophenol, 4-t-butyl-o-thiocresol, 4-t-butyl-p-thiocresol, 2-benzamidothiophenol, thiobenzoic acid, and zinc thiophenols and metal salts thereof, and thiocarboxylic acids and metal salts thereof and about 0.5 to about 3 parts by weight of an organic peroxide.

70. Following this amendment, the Examiner allowed the claims. (Ex. F, Notice of Allowance of 04/09/1993). The Examiner stated that “[n]othing in the prior art would suggest that utilization of the sulfur-containing agents, such as the pentachlorothiophenol disclosed by Kaplan et al., in lieu of the sulfur-containing molecular weight regulators of Tominaga et al. would result in the rubber golf balls having improved velocity upon impact.” (*Id.* at 2).

VII. OPINION REGARDING THE VALIDITY OF CLAIM 1 OF THE ‘961 PATENT

71. I understand that some of the terms in claims 1 and 2 of the ‘961 patent are at issue in *Markman* proceedings before the Court. I further understand that the disputes relate to whether the proper claim construction should include definitional information from the specification to help the jury understand the complex claim terms. Therefore, the outcome of the *Markman* proceeding should not effect my invalidity analysis of the ‘961 patent, as set forth below.

72. Claim 2 of the '961 patent is a dependent claim that depends from claim 1, which is an independent claim. It is my understanding that to anticipate claim 2, a prior art reference must disclose all of the limitations of both claim 2 and claim 1.

73. As set forth below, I have analyzed the '961 patent and it is my opinion that claims 1 and 2 of the '961 patent are anticipated and/or rendered obvious by numerous prior art references, as detailed below.

A. Preliminary Matters

1. Priority of the '961 Patent

74. I understand that the '961 patent claims priority from its Japanese filing date of May 30, 2001.

2. Opinion Regarding the Level of Skill in the Art for the '961 Patent

75. I understand that when evaluating the asserted claims with respect to the prior art, the evaluation must be done from the perspective of a hypothetical person of ordinary skill in the art as of the benefit date. In my opinion, one of skill in the art of the '961 patent, as of the filing date of the application that led to the '961 patent, would have had a B.S. degree in Chemistry or an equivalent discipline with five or more years of experience in the field of golf ball manufacture or equivalent experience in related arts using techniques for polymerizing polybutadiene.

B. Anticipation of Claims 1 and 2 by Prior Art References

1. U.S. Patent No. 6,612,940 to Nesbitt Anticipates Claim 1 and 2

76. U.S. Patent No. 6,612,940 to Nesbitt et al. ("Nesbitt '940") issued September 2, 2003, based on an application filed November 9, 2000 claiming priority to a provisional application filed on January 22, 1999. As Nesbitt '940 was filed before the priority date of the application that led to the '961 patent, Nesbitt '940 is prior art.

77. I have reviewed the Nesbitt '940 patent in light of claims 1 and Nesbitt '940 discloses each and every limitation of claims 1 and 2, and therefore anticipates claims 1 and 2. A copy of the Nesbitt '940 prior art reference is attached to this report as Exhibit G.

i. Claim 1

78. The preamble to claim 1 of the '961 patent states that it relates to "a multi-piece solid golf ball comprising a solid core, an inner cover layer and an outer cover layer, wherein the solid core is molded from a rubber composition comprising:"

79. Nesbitt '940 also relates to a multi-piece solid golf ball, with a solid core, an inner cover layer and an outer cover layer. (Ex. G, Nesbitt '940, at Abstract; col. 16, lines 49-57; col. 44, lines 60-65; Tables 30-37)

80. Claim 1 of the '961 patent requires a base rubber composition that comprises 20 to 100 wt % of a first polybutadiene ("polybutadiene (a)") having certain characteristics:

'961 Claim Requirements for Polybutadiene (a)	
Cis-1,4 content of at least 60%	
1,2 vinyl content of at most 2%	
Viscosity η at 25 °C as a 5 wt % solution in toluene of up to 600 mPa·s	
Synthesized using a rare-earth catalyst	
Satisfying the relationship: $10B + 5 \leq A \leq 10B + 60$	
A = Mooney viscosity B = Ratio Mw/Mn	

81. Viscosity is a measure of the resistance of a liquid or solution to flowing. A high viscosity means the fluid has a slow flow, i.e. like molasses. A low viscosity

means the liquid has a high flow, i.e. like water. With polymers, as the molecular weight increases, the viscosity usually increases.

82. Mooney viscosity is the measurement of viscosity used with rubbers. Since rubbers are solids, the Mooney viscosity measures the resistance of the rubbers to distortion.

83. Polydispersity (M_w/M_n) is a measure of the different lengths (and therefore weight) of the polymer molecules. M_w is the weight average molecular weight, which is the weight of molecules of a given length divided by the total weight. M_n is the number average molecular weight, which is the number of molecules of a given length divided by the total number of molecules. When the molecules are all of the same length, the polydispersity is one. The higher the polydispersity, the broader the differences in the lengths and weights of the molecules.

84. Nesbitt '940 discloses several core compositions that include polybutadiene rubbers that satisfy the requirements for the '961 patent's polybutadiene (a). One such example is Table 6 of the Nesbitt '940 patent, reproduced below, which includes Neo Cis 60 polybutadiene:

Most preferably, a core formulation in accordance with the present invention is as follows in Table 6:

TABLE 6

Ingredients	Parts	Wt. %
Croflex 1220x (BCP-820)	40	24.64
Neo Cis 60	30	18.48
Neo Cis 40	30	18.48
Zinc Oxide	24	14.78
Tungsten powder	0.17	0.105
Zinc Stearate	10.3	10.04
Zinc Dicarboxylate (ZDA)	20.5	12.63
Red MB	0.14	0.086

TABLE 6-continued

Ingredients	Parts	Wt. %
Triphenyl 42-4GB	1.24	0.76
Total	162.4	100

85. Table 6 shows a core formulation that is made up of 100 parts of base rubber that consists of three different commercially available types of polybutadiene

rubber: (a) 40 parts of Cariflex 1220x, (b) 30 parts of Neo Cis 60 and (c) 30 parts of Neo Cis 40. The remaining ingredients in Table 6 are not part of the base rubber composition of the core formulation.

86. The weight percent (wt %) of the ingredients in Table 6 represents the amount of each ingredient as a percentage of the entire core formulation. Therefore, although Neo Cis 60 accounts for 18.48% of the entire core formulation, it accounts for 30% (30 parts out of 100) of the base rubber. Similarly, Cariflex 1220x accounts for 40% (40 parts out of 100) and Neo Cis 60 accounts for 30% (30 parts out of 100) of the base rubber described in Table 6. As explained in detail below, Neo Cis 60 satisfies all of the requirements for the polybutadiene (a) of the '961 patent.

87. Table 2 of the Nesbitt '940 patent, reproduced below, discloses the properties of Neo Cis 40 and Neo Cis 60, respectively. Table 2 discloses that the cis-1,4 content of Neo Cis 60 is 97.5% and that it has a 1,2 vinyl content of 0.8%.

TABLE 2	
Properties of Neo Cis	
Properties of Raw Polymer	
Microstructure	
1,4 cis (typical)	97.5%
1,4 trans (typical)	1.7%
Vinyl (typical)	0.8%
Volatile Matter (max)	0.75%
Ash (max)	0.30%
Stabilizer (typical)	0.50%
Messner Viscosity, MI 1 + 4 at 100 °C	35-45 and 60-65
Properties of compound (typical)	
Vulcanization at 145° C.	
Tensile strength, 35° cure,	15 MPa
Elongation, 35° cure,	440%
300% modulus, 35° cure,	9.5 MPa

88. Independent laboratory testing on Neo Cis 60 was performed at my request to determine the solution viscosity of the Neo Cis 60 rubber at 25°C, as a 5 wt % solution in toluene.

89. The viscosity test discussed in the '961 patent uses a standard solution according to Japanese Industrial Standard (JIS) Z8809. JIS Z8809, included as Exhibit H, references JIS Z8803 (attached as Exhibit I), which relates to methods of measuring viscosity of liquids.

90. Therefore, at my direction, Alan Sentman, Ph.D., of Polymer Solutions, Inc. of Blacksburg Virginia, conducted solution viscosity measurements of Neo Cis 60 in accordance with JIS Z8809 and JIS Z8803.

91. The solution viscosity was obtained by using the protocol set forth in the '961 patent by dissolving 2.28 grams of polybutadiene to be measured in 50 mL of toluene and carrying out the measurement with a viscometer at 25°C using a standard solution for the viscometer. The viscometer was calibrated prior to testing the rubber sample through the use of certified viscosity standards. (*See* Ex. J, Certificates of Viscometer Calibration).

92. I observed the laboratory and testing methods of Polymer Solutions and it is my expert opinion that the tests performed were done properly and objectively.

93. The solution viscosity of Neo Cis 60 is 435.30 mPa·s. (Ex. K, Viscosity Calculation Spreadsheet).

94. The samples of Neo Cis BR-60 and Neo Cis BR-40 were obtained from the manufacturer, Polimeri Europa of Milan, Italy, through its United States distributor, Alternative Rubber and Plastics, Inc., of Amherst, NY.

95. As noted in the Nesbitt '940 patent, Neo Cis BR-60 and BR-40 were previously manufactured by Enichem Elastomers. (Ex. G, Nesbitt '940, col. 7, lines 44-45). Polimeri Europa merged with Enichem in or around 2001 and has since continued to

manufacture and sell Enichem's elastomer products, including Neo Cis BR-60 and BR-40. (See Ex. M, Polimeri Europa Webpage for BR-40 and BR-60).

96. Polimeri Europa confirmed to me in a telephone conversation and further by email to Acushnet attorneys that the Neo Cis BR-60 and BR-40 rubbers it currently manufactures and provides for sale in the United States are the same as the Neo Cis BR-60 and Neo Cis BR-40 that were manufactured by Enichem. (Ex. N, email from Polimeri Europa). I also confirmed this fact in a telephone conversation with Alternative Rubber and Plastics.

97. In fact, when shipping Neo Cis BR-60 and BR-40, Polimeri Europa currently includes the Material Safety Data Sheet for these rubbers that was created and used by Enichem. (Ex. O, MSDS Sheet)².

98. Moreover, in my experience, a manufacturer will not change the formulation of a commercially available rubber without changing the name of the rubber.

99. Neo Cis 60 is synthesized using neodymium, which is a rare-earth catalyst. (Ex. G, Nesbitt '940, at col. 14, lines 9-13.)

100. Table 2 of the Nesbitt '940 patent states that the Mooney viscosity of Neo Cis 60 is 60 to 66. (Ex. G, Nesbitt '940, at Table 2) The Nominal Mooney viscosity of Neo Cis 60 is 63. (Exhibit M, Polimeri Europa Product Webpage).

² To independently confirm that the Neo Cis samples from Polimeri Europa were the same as the Neo Cis rubber manufactured by Enichem, I requested Polymer Solutions, Inc., of Blacksburg, Virginia to run NMR tests on the samples to determine their 1,2-vinyl content. The results show that Neo Cis BR-60 had a 1,2 vinyl content of 0.83% and Neo Cis BR-40 had a 1,2 vinyl content of 0.82 %. (Exhibit P, NMR Results). These values are consistent with the values published in the Nesbitt '940 patent, at Table 2, which indicate the rubbers have a 1,2 vinyl content of 0.8 %.

101. At my direction, independent laboratory testing by Polymer Solutions, Inc. was performed on Neo Cis 60 to confirm the ratio of its weight average molecular weight Mw to its number average molecular weight Mn.

102. I observed the laboratory and testing methods of Polymer Solutions and it is my expert opinion that the tests performed were done properly and objectively.

103. The ratio of Neo Cis 60's weight average molecular weight Mw to its number average molecular weight Mn is 2.919. (Exhibit Q).

104. Based on its Mooney Viscosity ($A=63$) and the Mw/Mn Ratio ($B=2.919$), Neo Cis 60 satisfies the required relationship: $10B + 5 \leq A \leq 10B + 60$, as shown below:
 $10(2.919) + 5 \leq 63 \leq 10(2.919) + 60$; which equates to: $34.19 \leq 63 \leq 89.19$

105. In summary, Neo Cis 60 has all of the properties that are required for the polybutadiene (a) disclosed in claim 1 of the '961 patent:

'961 Claim Requirements for Polybutadiene (a)	Neo Cis 60
Cis-1,4 content of $\geq 60\%$	97.5%
1,2 vinyl content $< 2\%$	0.8%
Solution viscosity ≤ 600 mPa·s	435.30 mPa·s
Satisfying the relationship $10B + 5 \leq A \leq 10B + 60$ $A = \text{Mooney Viscosity}$ $B = \text{Polydispersity}$	Mooney = 63 Polydispersity = 2.919 $34.19 \leq 63 \leq 89.19$ Equation is satisfied.
Rare Earth Catalyst	Neodymium

106. Claim 1 further requires 0 to 80 wt % of a second diene rubber ("diene rubber (b)"). Referring back to Table 6 of the Nesbitt '940 patent, it discloses a core

formulation with 30 wt % of Neo Cis 40, which is a second diene rubber within the claimed range.

107. Claim 1 further requires 10 to 60 parts by weight of an unsaturated carboxylic acid or a metal salt thereof or both.

108. Zinc diacrylate (ZDA) is a metal salt of an unsaturated carboxylic acid.

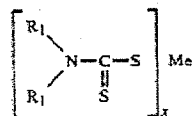
109. Table 6 of the '940 patent discloses a core formulation that includes 20.5 parts by weight of ZDA, which is within the 10 to 60 parts by weight required by claim 1 of the '961 patent.

110. Claim 1 further requires 0.1 to 5 parts by weight of an organosulfur compound.

111. The Nesbitt '940 patent incorporates by reference, U.S. Patent No. 4,852,884 to Sullivan ("Sullivan '884). (Ex. R). Nesbitt '940 discloses that the dithiocarbamates set forth in the Sullivan '884 patent may be incorporated into the polybutadiene compositions of the present invention. (Ex. G, Nesbitt '940, col. 13, lines 25-32: "the dithiocarbonates [sic] set forth in U.S. Pat. No. 4,852,884 may also be incorporated into the polybutadiene compositions of the present invention.")

112. Dithiocarbamates are organosulfur compounds. The Sullivan '884 patent provides the chemical formula for the dithiocarbamates at col. 2, lines 26-5-33 (Ex. R):

The dithiocarbamate component of the core composition is selected from those compounds of the formula



113. R1 connotes the presence of carbon, making the molecule organic, while S connotes the presence of sulfur, making the molecule an organic sulfur compound.

114. The Nesbitt '940 patent states that such compounds can be added to the core formulation in the amounts indicated in the incorporated patents. The Sullivan '884 patent discloses that dithiocarbamates can be included in amounts between 0.1 to 0.5 parts by weight. This is entirely within the claimed range for organosulfur compounds in the '961 patent. (Ex. R).

115. Claim 1 further requires 5 to 80 parts by weight of an inorganic filler.

116. Zinc oxide is an inorganic filler. (Ex. G, Nesbitt '940, at col. 12, lines 56-65).

117. Table 6 of the Nesbitt '940 patent discloses a core formulation with 24 parts by weight of zinc oxide, and inorganic filler, which is within the 5 to 80 parts by weight required by the '961 patent.

118. Claim 1 further requires 0.1 to 5 parts by weight of an organic peroxide.

119. Triganox 42-40B is an organic peroxide (Ex. G, Nesbitt '940, at col. 12, lines 8-24).

120. Table 6 of the Nesbitt '940 patent discloses a core formulation with 1.24 parts by weight of Triganox 42-40B, an organic peroxide, which is within the 0.1 to 5 parts by weight required by the '961 patent. In summary:

'961 Claim Requirements Core Formulation	Table 6 Nesbitt '940 Prior Art Core Formulation
20-100 wt % polybutadiene (a)	30 wt % Neo Cis 60
0-80 wt % diene rubber (b)	30 wt % Neo Cis 40
10 to 60 parts by weight unsaturated carboxylic acid	20.5 parts Zinc Diacrylate

or a metal salt thereof or both	(ZDA)
0.1 to 5 parts by weight of an organosulfur compound	0.1 to 0.5 parts dithiocarbamate ³
5 to 80 parts by weight of an inorganic filler	24 parts Zinc Oxide
0.1 to 5 parts by weight of an organic peroxide	1.24 parts Triganox 42-40B

121. Claim 1 of the '961 patent further requires the inner cover layer have a Shore D hardness of 50 to 80.

122. Table 34 of the Nesbitt '940 patent, reproduced below, shows that the Shore D hardness of the inner cover layer of the Nesbitt '940 prior art ball is about 70, which is within the claimed range of 50 to 80 in the '961 patent.

TABLE 34

Property	Intermediate Ball (from Table 33)			
	1	2	3	4
Flex Modulus (weighted avg.)	264 MPa	264 MPa	264 MPa	264 MPa
Stiffness Modulus	3521 Kg/cm ²	3521 Kg/cm ²	3521 Kg/cm ²	3521 Kg/cm ²
Size (Intermediate ball)	1.570" ± 0.004	1.570" ± 0.004	1.570" ± 0.004	1.570" ± 0.004
Weight (Intermediate ball)	38.3 g ± 0.3	38.3 g ± 0.3	38.3 g ± 0.3	38.3 g ± 0.3
Thickness	0.050" ± 0.008	0.050" ± 0.008	0.050" ± 0.008	0.050" ± 0.008
Rheol comp.	122 ± 12	112 ± 12	112 ± 12	156 ± 8
C.O.R.	0.780 ± 0.015	0.790 ± 0.015	0.790 ± 0.015	0.795 ± 0.015
Marine Specific Gravity	0.96 ± 0.01	0.96 ± 0.01	1.12 ± 0.03	1.12 ± 0.03
HS I	97 ± 1	97 ± 1	97 ± 1	97 ± 1
Shore C	97 ± 1	97 ± 1	97 ± 1	97 ± 1
Shore D	70 ± 1	70 ± 1	70 ± 1	70 ± 1

123. Claim 1 of the '961 patent further requires that the outer cover layer have a Shore D of 35 to 60.

124. Table 37 of the Nesbitt '940 patent, reproduced below, shows that the Shore D hardness of the outer cover layer of the Nesbitt '940 prior art ball is 46, which is within the claimed range of 35 to 60 in the '961 patent.

³ As explained above, the Nesbitt '940 patent contemplates the addition of dithiocarbamates to the core formulation.

TABLE 37

Property	Finished Ball (from Table 36)			
	A	B	C	D
Flex Modulus (weighted avg.)	58 MPa	58 MPa	240 MPa	140 MPa
Stiffness Modulus (estimate)	~390 Kg/cm ²	~390 Kg/cm ²	1820 Kg/cm ²	763 Kg/cm ²
Combined Mantle/Cover Stiffness	~700 Kg/cm ²	~700 Kg/cm ²	1942 Kg/cm ²	—
Cover Specific Gravity	0.98 ± 0.01	0.98 ± 0.01	0.98 ± 0.01	0.98 ± 0.01
Size	1.685" ± 0.005	1.685" ± 0.005	1.685" ± 0.005	1.685" ± 0.005
Weight	45.4 g ± 0.4	45.4 g ± 0.04	45.4 g ± 0.4	45.4 g ± 0.04
Rieble Compression	105 ± 10	101 ± 10	98 ± 5	85 ± 5
C.O.R.	0.770 ± 0.015	0.780 ± 0.015	0.760 ± 0.015	0.760 ± 0.015
JIS C	72 ± 1	72 ± 1	93 ± 1	87 ± 1
Shore C	72 ± 1	72 ± 1	95 ± 1	87 ± 1
Shore D	46 ± 1	46 ± 1	62 ± 1	58 ± 1

125. Claim 1 of the '961 patent further requires that the outer cover layer have a lower Shore D hardness than the inner cover layer.

126. As shown above with reference to Tables 34 and 37, the Nesbitt '940 patent discloses a golf ball with an inner cover hardness of about 70 and an outer cover hardness of about 46. This example, therefore, discloses a golf ball wherein the outer cover layer has a lower Shore D hardness than the inner cover layer, as required by claim 1 of the '961 patent. In summary:

'961 Claim Requirements Shore D Hardness Requirements	Nesbitt '940 Prior Art Shore D Hardness
Inner Cover Shore D = 50 to 80	71
Outer Cover Shore D = 35 to 60	42
Outer Cover Softer Than Inner Cover	42 is less than 71

ii. Claim 2

127. Claim 2 depends from claim 1 and further requires the diene rubber (b) to include 30 to 100 wt % of a second polybutadiene having certain characteristics:

'961 Claim 2 Requirements for Second Polybutadiene (b)
Cis-1,4 content of at least 60%
1,2 vinyl content of at most 5%

Mooney viscosity of not more than 55
Satisfying the relationship: $\eta \leq 20A - 550$
A = Mooney viscosity η = solution viscosity of second polybutadiene

128. In addition to disclosing a core formulation with 30 % Neo Cis 60, Table 6 of the Nesbitt '940 patent, referred to above, discloses a core formulation, which includes 30 parts Neo Cis 40, which is a second polybutadiene in the core formulation that is 100% polybutadiene, as required by claim 2 of the '961 patent. As explained in detail below, Neo Cis 40 satisfies all of the requirements for the second polybutadiene (b) disclosed in claim 2 of the '961 patent.

129. Table 2 of the Nesbitt '940 patent, reproduced above, discloses that the cis-1,4 content of Neo Cis 40 is 97.5% and that it has a 1,2 vinyl content of 0.8%.

130. Table 2 of the Nesbitt '940 patent discloses that the Mooney viscosity of Neo Cis 40 is 38 to 48. (Ex. G, Nesbitt '940, at Table 2) The Nominal Mooney viscosity of Neo Cis 40 is 43. (See Ex. M, Polimeri Europa Product Webpage).

131. Independent laboratory testing on Neo Cis 40 was performed at my request to determine the solution viscosity η of the Neo Cis 40 rubber at 25°C, as a 5 wt % solution in toluene.

132. The same protocol used to obtain the solution viscosity for Neo Cis 60 was used to obtain the solution viscosity of Neo Cis 40.

133. In my opinion, the tests performed were done properly and objectively.

134. The solution viscosity of Neo Cis 40 is 265.30 mPa·s. (Exhibit K).⁴

⁴ I understand that U.S. Patent No. 5,708,081 (Ex. S), filed in 1994, discloses that the solution viscosity for Neo Cis BR-40 as a 5 wt % solution in *styrene* is 330 mPa·s. The '961 patent requires the solution viscosity be measured in *toluene*. At my request, Polymer Solutions, Inc. further tested the solution

135. Based on its Mooney Viscosity ($A = 43$) and its Solution Viscosity ($\eta = 265.30$ mPa·s), Neo Cis 40 satisfies the required relationship: $\eta \leq 20A - 550$, as shown below:

$$265.30 \leq 20(43) - 550; \text{ which equates to: } 265.30 \leq 310$$

136. In summary, Neo Cis 40 has all of the properties that are required for the second polybutadiene (b) disclosed in claim 2 of the '961 patent:

'961 Claim Requirements Second Polybutadiene (b)	Neo Cis 40
Cis-1,4 content of $\geq 60\%$	97.5%
1,2 vinyl content $\leq 5\%$	0.8%
Mooney Viscosity ≤ 55	43
Satisfying the relationship $\eta \leq 20A - 550$ A = Mooney Viscosity η = Solution Viscosity	Mooney Viscosity = 43 Solution Viscosity = 265.30 mPa·s $265.30 \leq 310$ Equation is satisfied.

137. It is my opinion that Table 6 of the Nesbitt '940 patent anticipates the core formulation disclosed in claim 1 and 2 of the '961 patent. It is my further opinion that Tables 34 and 37 of the Nesbitt '940 patent anticipate the Shore D hardness requirements for the covers disclosed in claims 1 and 2 of the '961 patent. Because claims 1 and 2 of the '961 patent were fully disclosed in the Nesbitt '940 prior art reference, it is my opinion that those claims are invalid.

138. It is my understanding that because claim 1 of the '961 patent uses the term "comprising" in describing the core formulation of the invention, additional materials may be present in the core formulation besides those specifically identified in

viscosity of the Neo Cis BR-40 sample as a 5 wt % solution in styrene and found the solution viscosity to be 336 mPa·s. (Ex. T, Styrene Solution Viscosity Calculation). This further confirms that the Neo Cis manufactured by Enichem has not changed.

the claim. Therefore, it is my understanding that the presence of Cariflex 1220x or other unclaimed ingredients, such as Red MB, are irrelevant to the invalidity analysis.

139. Nesbitt '940 characterizes Cariflex 1220x as an ultra high Mooney polybutadiene rubber. Nesbitt '940 refers to this type of polybutadiene as a "first polybutadiene." (Ex. G, Nesbitt '940, at col. 6, lines 35-39).

140. Nesbitt '940 further characterizes Neo Cis 40 and Neo Cis 60 as a polybutadiene obtained by utilizing a rare earth catalyst and that exhibits a Mooney viscosity in the range of about 30 to 70. Nesbitt '940 refers to this type of polybutadiene as a "second polybutadiene." (Ex. G, Nesbitt '940, at col. 7, lines 31-40).

141. Nesbitt '940 discloses that the compositions of his invention may also utilize other polybutadiene resins in addition to the first and second particular polybutadienes, including Cariflex BR-1220, available from Dow Chemical. (Ex. G, Nesbitt '940, at col. 9, lines 40-55). Based on these disclosures, Nesbitt '940 contemplates a base rubber composed of Cariflex 1220x, Neo Cis 40 (and/or Neo Cis 60) and Cariflex BR-1220.

142. I have analyzed the properties of Cariflex BR-1220 and have determined that this polybutadiene rubber would meet the '961 claim requirements for the second polybutadiene of claim 2, just as Neo Cis 40 does, as explained above.

143. Table 4 of the Nesbitt '940 patent, reproduced below, discloses the properties of Cariflex BR-1220. Table 4 discloses that the cis-1,4 content of Cariflex BR-1220 is 97-99%:

TABLE 4

Properties of Cariflex BR-1220 Polybutadiene

Physical Properties:

Polybutadiene Rubber:
 CIS 1,4 Content - 97%-99% Min.
 Stabilizer Type - Non Staining
 Total Ash - 0.5% Max.
 Specific Gravity - 0.90-0.92

TABLE 4-continued

Properties of Cariflex BR-1220 Polybutadiene

Color - Transparent, clear, Lt. Amber
 Moisture - 0.3% max. ASTM 1416.76 Hot Mill Method
 Polymer Mooney Viscosity - (35-45 Cariflex) (MI) - + @ 212 F;
 90% Cure - 10.0-13.0
 Polydispersity 2.5-3.5

144. At my direction, independent laboratory testing by Polymer Solutions, Inc. was performed on Cariflex BR-1220 to confirm its 1,2 vinyl content.

145. I observed the laboratory and testing methods of Polymer Solutions and it is my expert opinion that the tests performed were done properly and objectively.

146. The 1,2 vinyl content of Cariflex BR-1220 is 1.35% (Ex. P).

147. A sample of BR-1220 was obtained from Dow Chemical. (Ex. U, Certificate of Analysis of BR-1220 and CB-23).

148. Table 4 of the Nesbitt '940 patent states that the Mooney viscosity of Cariflex BR-1220 is 35-45. (Ex. G, Nesbitt '940, at Table 4). The nominal Mooney viscosity of Cariflex BR-1220 is 40.

149. Independent laboratory testing on Cariflex BR-1220 was performed to determine the solution viscosity η of the rubber at 25°C, as a 5 wt % solution in toluene.

150. The same protocol used to obtain the solution viscosity for Neo Cis 40 and 60 was used to obtain the solution viscosity of Cariflex BR-1220.

151. It is my expert opinion that the tests performed were done properly and objectively.

152. The solution viscosity of Cariflex BR-1220 is 54.21 mPa·s. (Ex. K).

153. Based on its Mooney Viscosity ($A = 40$) and its Solution Viscosity ($\eta = 54.21$ mPa·s), Cariflex BR-1220 satisfies the required relationship: $\eta \leq 20A - 550$, as shown below:

$54.21 \leq 20(40) - 550$; which equates to: $54.21 \leq 250$

154. In summary, Cariflex BR-1220 has all of the properties that are required for the second polybutadiene (b) disclosed in claim 2 of the '961 patent:

'961 Claim Requirements Second Polybutadiene (b)	Cariflex BR-1220
Cis-1,4 content of $\geq 60\%$	97-99 %
1,2 vinyl content $\leq 5\%$	1.35 %
Mooney Viscosity ≤ 55	40
Satisfying the relationship $\eta \leq 20A - 550$ A = Mooney Viscosity η = Solution Viscosity	Mooney Viscosity = 40 Solution Viscosity = 63 to 72 mPa·s $54.21 \leq 250$ Equation is satisfied.

155. The addition of Cariflex BR-1220 into a core formulation that contains a first and second polybutadiene, as defined by Nesbitt '940, would anticipate claim 2 of the '961 patent. For example, referring again to Table 6 of the Nesbitt '940 patent, the addition of Cariflex BR-1220 as a base rubber to that formulation (or the substitution of it for Neo Cis 40) would further satisfy the limitations for polybutadiene (b) of claim 2.

156. Therefore, it is my opinion that claims 1 and 2 of the '961 patent is anticipated by Nesbitt '940.

C. Opinion Regarding Invalidity of Claim 2 of the '961 Patent as Obvious

157. I understand that a claim is invalid if it is obvious in light of the prior art. When determining obviousness, I understand that more than one reference may be combined to invalidate the claim in question. When combining references, I understand that a motivation to combine the references must exist in the references themselves, or in light of the experience of one of ordinary skill in the art.

158. Further, when determining obviousness of a claim, I understand that secondary considerations also must be considered. These secondary considerations

include commercial success, a long-felt but unresolved need, failure of others, licensing, copying, and teaching away/skepticism of others.

159. It is my opinion that to the extent any element of claim 2 of the '961 patent is not fully described in the Nesbitt '940 patent, the '961 patent is still invalid based on obviousness.

1. Combination of Prior Art References

160. Claim 2 of the '961 patent is obvious by the combination of any of: (a) Nesbitt '940 patent; (b) U.S. Patent No. 6,486,261 ("Wu '261"); (c) the knowledge of those of ordinary skill in the art.

i. Nesbitt '940 in Combination with the Knowledge of One of Ordinary Skill in the Art

161. The Nesbitt '940 patent is discussed fully above.

162. A person of ordinary skill in the art, possessed with the understandings and knowledge reflected in the prior art, including the Nesbitt '940 patent, and motivated by the general problem facing the inventors, would have been led to make the combinations recited in claim 2 of the '961 patent.

163. Nesbitt '940 discloses golf ball core formulations made of blends of polybutadiene rubbers synthesized from neodymium catalysts (such as Neo Cis 40, Neo Cis 60, CB-22, CB-23 and CB-24), and from ultra high Mooney rubbers (such as BR-1220x). Nesbitt '940 further discloses such core compositions can also contain other polybutadiene rubbers with lower Mooney viscosities (such as BR-1220, Taktene 220 and Neo Cis 40) (*See* Ex. G, Nesbitt '940, at col. 6 line 55 – col. 9 line 56 and Table 6). It was known in the prior art that such polybutadiene rubbers were well-suited for the manufacture of golf ball cores.

164. I have reviewed the physical characteristics of the rubbers disclosed in Nesbitt '940 and have found that at least Neo Cis 40, Neo Cis 60 and CB-23 inherently possess the claimed attributes of polybutadiene (a) of claim 1 of the '961 patent.⁵

165. I have further found, as shown above, that at least Neo Cis 40 and BR-1220 inherently possess the claimed attributes of polybutadiene (b) of claim 2 of the '961 patent.

166. Nesbitt '940 suggests blending rubbers with the attributes of polybutadiene (a) with rubbers with the attributes of polybutadiene (b). It would have been a matter of routine optimization for one of ordinary skill in the art to blend a golf ball core composition using amounts of each type of polybutadiene within the ranges claimed by the '961 patent.

167. In fact, the idea of blending rubber compositions together to form a core was well-known to skilled artisans. In addition to Nesbitt' 940, other prior art patents disclose the blending of such rubbers for a golf ball core, including U.S. Patent No. 5,508,350 to Cadorniga ("Cadorniga '350") (Ex. W), U.S. Patent No. 6,486,261 to Wu et al. ("Wu '261") (Ex. X) and U.S. Patent No. 4,683,257 to Kakiuchi et al. (Kakiuchi '257) (Ex. Y), which is assigned to Bridgestone.

168. Cadorniga '350 discloses a golf ball core formulation made of 50 parts CB-23 and 50 parts Neo Cis 40. (Ex. W, Cadorniga '350, col. 7, line 36-65). The table from Cadorniga '350, reproduced below, further shows a blended polybutadiene golf ball

⁵ My analysis of Neo Cis BR-60 as a polybutadiene (a) of the '961 patent was fully discussed above. Please see Exhibit V for my analysis of Neo Cis 40 and CB-23.

core formulation with inorganic filler (zinc oxide), unsaturated carboxylic acid (zinc diacrylate) and peroxide⁶ within the claimed ranges of the '961 patent:

FORMULAS	1	2	3	4	5	6	7	8	9	10
MATERIALS	PIR	PIR	PIR	PIR	PIR	PIR	PIR	PIR	PIR	PIR
NEO CIS 40	50	50	50	50	50	50	50	50	50	50
CB-22	50	50	50	50	50	50	50	50	50	50
BARYTES	—	—	—	—	—	—	—	—	—	—
ZNO	20.0	20.0	20.0	20.0	20.0	20.0	19.75	19.75	19.75	19.75
ZDA	26.5	26.5	26.5	26.5	26.5	26.5	27.5	27.5	27.5	27.5
ZN PALMATE ¹	—	4.68	—	—	2.34	—	—	4.85	—	—
ZN PALMATE ²	—	—	—	4.68	—	2.34	—	—	—	4.85
ZN STEARATE ¹	4.68	—	—	—	2.34	—	4.85	—	—	—
ZN STEARATE ²	—	—	4.68	—	—	2.34	—	—	4.85	—
KEGRIND	—	—	—	—	—	—	—	—	—	—
PEROXIDE	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
PHYSICAL PROPERTIES										

169. Kakiuchi '257 further demonstrates that blending polybutadienes for core formulations was well known in the golf ball art much earlier than the priority date of the '961 patent. (Ex. Y, Kakiuchi '257, col. 2, lines 42-51).

170. Therefore, to the extent Nesbitt '940 does not explicitly disclose a golf ball formulation with the blend of rubbers described in the '961 patent, it would have been obvious based on the disclosures in Nesbitt '940 and the knowledge of one of ordinary skill in the art to formulate such a blend.

171. It was further well known in the prior art that the addition of sulfur compounds, as a peptizing agent or radical scavenger, aided in the processability of synthetic rubbers such as high cis polybutadiene. Moreover, the prior art shows that it was even well known in the golf ball art, that the use of sulfur compounds was beneficial. (See, e.g., Ex. D, U.S. Patent No. 5,252,652 and Ex. FF, U.S. Patent No. 4,556,220). For example, Bridgestone's '652 patent, filed in 1990 (twelve years prior to the '961 patent) discloses the benefits of sulfur compounds in the manufacture of improved golf ball cores. (See Ex. D, '652 patent, Abstract).

⁶ Cadorniga '350 specifically discloses that the organic peroxide dicumyl peroxide may be used. (Ex. W, Cadorniga '350, at col. 3, lines 14-16).

172. Therefore, to the extent one were to conclude that Nesbitt '940 does not disclose using a sulfur compound in the formulation of golf ball cores, such use was well known in the prior art, and would have been obvious to one of ordinary skill in the art to include a sulfur compound.

173. As such, it is my conclusion that, in addition to being anticipated as stated above, claims 1 and 2 of the '961 patent are also obvious in light of the Nesbitt '940 patent and the knowledge of those of ordinary skill in the art.

ii. Wu '261 in Combination with the Knowledge of One of Ordinary Skill in the Art

174. U.S. Patent No. 6,486,261 to Wu et al. ("Wu '261") (Ex. X) issued November 26, 2002, based on an application filed November 27, 2000 as a continuation-in-part of earlier filed applications dating back to December 24, 1998. I understand that the November 2000 filing date makes the Wu '261 patent prior art to the '961 patent.

175. A person of ordinary skill in the art, possessed with the understandings and knowledge reflected in the prior art, including the Wu '261 patent, and motivated by the general problem facing the inventors, would have been led to make the combinations recited in claim 2 of the '961 patent.

176. Wu '261 describes several core and cover golf ball compositions that may be used to provide desirable resiliency characteristics without sacrificing performance characteristics. (Ex. X, Wu '261, col. 5, lines 25-30).

177. Table 1 of the Wu '261 patent, reproduced below, lists several polybutadienes that may be used to produce resilient golf ball cores, and includes the rubbers discussed above with respect to the Nesbitt '940 patent, including Neo Cis BR-60, Neo Cis BR-40, Cariflex BR-1220, CB-23 and CB-22:

TABLE 1

Resilience Index of example polybutadiene polymers			
Rubber	Jin H et al		Resilience Index of
	1000 psi	1000 psi	
CB25	0.954	0.407	55
CB22	0.895	0.358	54
BR 40	0.739	0.350	46
BR 40	0.841	0.446	46
Polysar 8825	0.720	0.414	31
LAIRPLEX BR1220	0.487	0.439	5
BUDENE 1207G	0.825	0.388	44

178. Wu '261 teaches that a blend of these rubbers may be used to form the core of a golf ball. (Ex. X, Wu '261, col. 25, lines 3-4). Wu '261 discloses that "at least one" of the rubber materials may be used in the core formulation, thereby further suggesting the well known fact that the core formulations may be blends of two or more rubber materials. (Ex. X, Wu '261, col. 25, lines 3-4).

179. Wu '261 further teaches the use of crosslinking agents, specifically one or more metallic salts of unsaturated fatty acids or monocarboxylic acids. (Ex. X, Wu '261, col. 15, line 63 to col. 16, line 14). The amount and type of crosslinking agent may be varied or selected depending on the amount of desired compression. Wu '261 explains that selecting the amount of crosslinking agent is well known to skill artisans and that a typical amount of crosslinker may be from 10 to 40 percent by weight of the base rubber. (Ex. X, col. 16, lines 7-14).

180. Wu '261 further teaches the use of 0.1 to 5 parts of an organosulfur compound to convert a portion of cis-isomer to trans-isomer during the molding cycle. (Ex. X, Wu '261, col. 12 to col. 14, line 29).

181. Wu '261 discloses the use of inorganic fillers to achieve a desired weight distribution. (Ex. X, Wu '261, col. 16, lines 17-36). Examples provided in Wu '261 show inorganic fillers in amounts from 5 to 39 parts per hundred parts of the base rubber.

(Ex. X, Wu '261, Tables 2, 4, 5 and 6). Moreover, varying the amount of inorganic fillers in a golf ball core was well within the level of the skilled artisan, as shown in several prior art patents, including the Nesbitt '940 patent and the Kakiuchi '257 patent. (Ex. Y, Kakiuchi '257, col. 5, lines 1-31, disclosing the use of 10 to 70 parts of inorganic filler). Kakiuchi '257 teaches a polybutadiene core composition that is rendered crosslinkable by incorporating an unsaturated carboxylic acid or salt and other ingredients such as inorganic filler and organic peroxide in suitable proportions. (Ex. Y, Kakiuchi, col. 5, lines 1-5).

182. Wu '261 patent discloses the addition of organic peroxide, in amounts from 0.1 to 15 parts per hundred, and more preferably between 0.2 and 5 parts. (Ex. X, Wu '261, col. 15, lines 37-62).

183. Wu '261 further discloses a golf ball having a soft outer cover, with a Shore D hardness of 35 to 60, over a hard inner cover, with a Shore D hardness of 50 to 80. (Ex. X, col. 15, lines 6-10; col. 26, lines 14-22). Wu '261 teaches use of an outer cover layer that is softer than the inner cover layer. (Ex. X, Wu '261, col. 26, lines 14-16).

184. Based on the disclosures of Wu '261, it would be a matter of routine optimization for one of ordinary skill in the art to formulate a golf ball core composition using amounts of each type of polybutadiene described in claim 2 of the '961 patent.

iii. Nesbitt '940 in Combination with Wu '261 and the Knowledge of One of Ordinary Skill in the Art

185. A person of ordinary skill in the art, possessed with the understandings and knowledge reflected in the prior art, and motivated by the general problem facing the

inventors, would have been led to make the combinations recited in claim 2 of the '961 patent.

186. The Nesbitt '940 patent and Wu '261 patent, both discussed at length above, disclose all of the limitations of the asserted claims of the '961 patent.

187. To the extent Nesbitt '940 does not explicitly disclose a golf ball formulation with the blend of rubbers described in the '961 patent, it would have been obvious based on the disclosures in Wu '261, and/or the knowledge of one of ordinary skill in the art, to formulate such a blend.

188. As discussed above, the idea of blending rubber compositions together to form a core was well-known to skilled artisans. In addition to Nesbitt '940 and Wu '261, other prior art patents disclose the blending of such rubbers for a golf ball core, including Cadorniga '350 (Ex. W) and Kakiuchi '257 (Ex. Y).

189. Both Nesbitt '940 and Wu '261 are related generally to golf balls and more specifically to multi-layer golf balls with a core formulated from polybutadiene rubber. Both prior art references are further directed to improving the flight distance of golf balls. (Ex. G, Nesbitt '940 Abstract; Ex. X, Wu '261, col. 1, lines 24-25).

190. Therefore, motivation to combine Nesbitt '940 with Wu '261 is provided by the prior art references themselves, the knowledge of one of ordinary skill in the art and what the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art. It is my opinion, therefore, that in addition to being anticipated, the asserted claims of the '961 patent are also obvious.

iv. Additional Prior Art References

191. Several additional prior art patents further show that the claimed invention of the '961 patent was already known prior to its filing date.

192. For example, U.S. Patent 6,162,135 to Bulpett et al. (Bulpett '135) (Ex. Z), discloses a golf ball with a double cover having a solid center, an inner cover, and an outer cover. (Ex. Z, Bulpett '135, col. 22, lines 33-36). Bulpett further discloses a core composition made of a high cis-polybutadiene rubber with a low 1,2 vinyl content. (Ex. Z, Bulpett '135, col. 8, lines 18-28). The core composition of Bulpett also includes metallic salts of unsaturated fatty acids, including zinc acrylate, in amounts from about 10 to 40 percent of the base rubber. (Ex. Z, Bulpett '135, col. 10, lines 7-28). Bulpett further teaches the addition of an organosulfur compound to the core in amount of 0.1 to 8 parts per hundred base rubber. (Ex. Z, Bulpett '135, col. 4, lines 34-44). Bulpett further teaches the addition of inorganic filler to the core, such as zinc oxide and tin oxide. (Ex. Z, Bulpett '135, col. 16, lines 17-36; see also Tables 2-6). Bulpett further teaches the addition of an organic peroxide to the core preferably in an amount of 0.2 to 5 parts per hundred of base rubber. (Ex. Z, Bulpett '135, col. 9, line 55 – col. 10, line 6).

193. U.S. Patent 6,975,131 to Cavallaro et al. (Cavallaro '131) (Ex. AA) discloses a golf ball including a solid core, an outer cover layer and a casing disposed between the core and cover layer. (Ex. AA, Cavallaro '131, Abstract; col. 1, lines 11-14). Cavallaro further discloses using a base rubber composed of CB-23 and BR-60, which I have found to possess all of the claimed limitations of polybutadiene (a) of claim 1 of the '961 patent. (Ex. AA, Cavallaro '131, col. 14, lines 6-14). Cavallaro further discloses the addition of an unsaturated carboxylic acid, including zinc diacrylate, in an amount preferably from about 10 to 40 parts per hundred base rubber. (Ex. AA, Cavallaro '131, col. 5, line 64 – col. 6, line 19). Cavallaro further teaches the addition of an organosulfur compound in an amount less than 40 parts per hundred rubber. (Ex. AA, Cavallaro '131,

col. 6, lines 16-19). Cavallaro teaches the use of inorganic fillers in the core of a golf ball, such as zinc oxide, tungsten, and barium sulfate. (Ex. AA, Cavallaro '131, col. 6, lines 10-38). Cavallaro further discloses the addition of an organic peroxide to the core, including dicumyl peroxide. (Ex. AA, Cavallaro, '131, col. 5, lines 18-24).

194. Cavallaro further discloses an inner cover with a Shore D hardness between about 40 and about 70, and an outer cover with a Shore D hardness of less than about 40, in which the outer cover is softer than the inner cover. (Ex. AA, Cavallaro '131, col. 2, lines 43-48; col. 2, lines 6-23; col. 2, lines 32-42).

195. Based on the disclosures of these patents it would be a matter of routine optimization for one of ordinary skill in the art to formulate a golf ball as claimed in the '961 patent. It is my opinion, therefore, that in addition to being anticipated, the asserted claims of the '961 patent are also obvious.

VIII. OPINION REGARDING THE INVALIDITY OF CLAIMS 1, 5 AND 9 OF THE '652 PATENT BY PRIOR ART

A. *Markman* Proceedings Related to the '652 Patent

196. I understand that some of the terms in the asserted claims of the '652 patent are at issue in *Markman* proceedings before the Court. Specifically, the parties dispute the meaning of "about" and the meaning of the following phrase: "A base rubber selected from the group consisting of polybutadiene rubber, natural rubber, polyisoprene rubber and styrene-butadiene rubber." The Court's ultimate resolution of these claim construction disputes may affect my invalidity analysis.

197. With respect to "about," I understand that both parties agree that this term means "approximately," but dispute the extent to which the modifier "approximately" expands the claimed numerical ranges in the patent. Claim 1 of the '652 patent requires

“*about 25 to about 40 parts by weight of a zinc or magnesium salt of an unsaturated fatty acid having 3 to 8 carbon atoms.*” Similarly, claim 1 also requires “*about 0.05 to about 2 parts by weight of a sulfur compound*” and “*about 0.5 to about 3 parts by weight of an organic peroxide.*”

198. I understand that Acushnet contends that “about” should be defined in terms of measurement precision of the values in question, whereas Bridgestone contends that “about” should be defined more broadly as “in the stylistic and technological context in which it is used.” (Ex. BB, Acushnet Opening *Markman* Brief; Ex. CC, Bridgestone Opening *Markman* Brief). The ultimate resolution of this dispute will effect my opinion as to whether the ‘652 patent is entitled to rely on its Japanese filing date for priority, as explained below.

199. The parties also dispute the proper construction of “A base rubber selected from the group consisting of polybutadiene rubber, natural rubber, polyisoprene rubber and styrene-butadiene rubber.” I understand that the dispute here is whether this claim language allows the base rubber to be composed of more than one of the listed rubbers (i.e., allows blends). I do not believe that the resolution of this dispute will affect my invalidity analysis with respect to the ‘652 patent.

B. Priority Date of the ‘652 Patent

200. I understand that Bridgestone contends that the ‘652 patent is entitled to claim priority back to a Japanese application filed November 5, 1989 in Japan. (“the Japanese application”).

201. I understand that one requirement under the patent laws to claim priority back to a foreign application is that the foreign application must support the full range of the later-filed claim. Thus, I have been asked to consider whether the disclosures

contained in the '652 patent's Japanese application reasonably conveyed to one of skill in the art that the inventors had possession of the full scope of the U.S. claims at the time they filed the Japanese application.

202. After reviewing the Japanese application (Ex. DD), it is my opinion that the Japanese application supports the claims of the '652 patent only if Acushnet's construction of the claim term "about" is adopted by the Court.

203. The Japanese application does not disclose or support Bridgestone's proposed construction of "about" as it relates to the claimed ranges for the unsaturated fatty acid, the sulfur compound, or the organic peroxide of claim 1.

204. The Japanese application does not provide any indication that the amount of these required components can be anywhere outside of the claimed ranges. Unlike the '652 patent's use of the term "about," the Japanese application does not contain any such language of approximation.

205. I understand that Acushnet's proposed construction for "about" means approximately, with reference to the typical measurement errors involved in making the pertinent measurements. Under this construction, it is my opinion that the Japanese application may enable the full scope of the U.S. claims at the time they filed the Japanese application.

206. The Japanese application, however, does not provide support for amounts of these ingredients that is outside the typically associated standards of error involved in making the pertinent measurements, as Bridgestone's proposed construction of "about" may allow. Therefore, if the Court adopts Bridgestone's proposed construction of "about," it is my opinion that the Japanese application would not reasonably convey to

one of ordinary skill in the art, that the inventors had mental possession of the entire scope of claim 1 as of the filing date of the Japanese application.

207. In summary, under Acushnet's proposed construction of "about," I have concluded that '652 patent may be entitled to its Japanese filing date of November 5, 1989.

208. Under Bridgestone's proposed construction of "about," I have concluded that the '652 patent is not entitled to rely on its Japanese filing date. In this situation, the earliest patent application in the chain leading to the '652 patent that contains a disclosure that supports claim 1 of the '652 patent is its U.S. filing date of May 10, 1990.⁷

C. Opinion Regarding the Level of Skill in the Art for the '652 Patent

209. It is my opinion that the level of ordinary skill in the art as of November 5, 1989 (Japanese application date) would not have differed substantially from that as of May 10, 1990 (U.S. filing date). Therefore, my opinion as to the level of skill is not affected by whether the '652 patent is entitled to its Japanese application date.

210. In my opinion, one of skill in the art of the '652 patent, is the same as that for the '961 patent.

D. Anticipation of Claims 1, 5 and 9 by the Prior Art References

211. Claim 1 is an independent claim. Claims 5 and 9 are dependent claims. Claim 5 depends on claim 3, which depends on claim 1. Claim 9 depends on claim 7, which depends on claim 6, which depends on claim 1. Therefore, I have reviewed the validity of claims 1, 3, 5, 6, 7 and 9.

⁷ Because all other asserted claims ultimately depend from claim 1, the priority date for the '652 patent will be the same for all claims.

212. As set forth below, I have analyzed the claims and conclude that each of claims 1, 3, 5, 6, 7 and 9 of the '652 patent are anticipated and/or rendered obvious by numerous prior art references.

**1. Fujii Japanese Kokai Publication No. 02-092378
Anticipates Claims 1, 5, and 9**

213. I have reviewed the Japanese Kokai Publication No. 02-092378 to Yoshihiko Fujii ("Fujii Reference") (Ex. EE) entitled "Manufacture of Solid Golf Ball" in light of the asserted claims of the '652 patent. It is my opinion that the Fujii Reference discloses each and every limitation of claims 1, 3, 5, 6, 7 and 9 and therefore anticipates each.

214. The Fujii Reference was published on April 3, 1990. If the priority date of the '652 patent is its U.S. filing date of May 10, 1990, then the Fujii Reference is prior art, since it was published in a printed publication before the effective filing date of the '652 patent.

215. If the '652 patent is entitled to claim priority back to its earlier Japanese application date, then I understand that the Fujii Reference would not be statutory prior art under Sections of the U.S. Patent Act. It would, however, still be indicative of the level of knowledge and skill of those of ordinary skill in the art at the time the '652 patent application was filed.

216. The Fujii reference provides a manufacturing method of a solid golf ball, wherein a "radical scavenger," such as pentachlorothiophenol (PCTP), is added to a rubber composition comprised of a base rubber, a metallic salt of methacrylic or acrylic acid, a peroxidic cross linking initiator, then vulcanized and formed into a spherical core of a one-piece or multi-layer ball. The PCTP (a/k/a the radical scavenger) captures the

radicals generated by the peroxidic crosslinking initiator, thereby improving the extension and intensity of the rubber composition without changing the hardness, weight and rebound resilience. Fujii discloses that balls manufactured in this method exhibit desirable flight properties and are further excellent in impact properties and durability. (Ex. EE, Fujii, page 462).

i. Claim 1

217. The preamble to claim 1 of the '652 patent states that it relates to "a solid golf ball, having an improved rebound property and initial velocity."

218. Fujii also relates to the manufacture of such a solid golf ball. Fujii states that the solid golf ball of its invention has "excellent impact properties and durability" and "exhibit desirable flight properties." (Ex. EE, Fujii, page 461).

219. Claim 1 of the '652 patent requires the base rubber to be composed of 100 parts by weight of a base rubber selected from the group consisting of polybutadiene rubber, natural rubber, polyisoprene rubber, and styrene-butadiene rubber.

220. Fujii states that base rubbers which are normally used for forming a solid core can be used. Fujii specifically discloses that the base rubber can be composed of butadiene rubber, natural rubber, an isoprene rubber, and a combination thereof. (Ex. EE, Fujii, page 462).

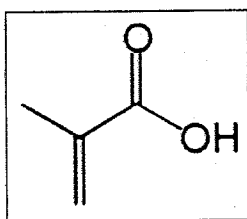
221. Claim 1 of the '652 patent further requires the golf ball of its invention to contain about 25 to about 40 parts by weight of a zinc or magnesium salt of an unsaturated fatty acid having 3 to 8 carbon atoms.

222. Fujii discloses the addition of both zinc and magnesium salts of methacrylic acid, which is an unsaturated fatty acid having 4 carbon atoms. (Ex. EE, Fujii, page 462).

223. The chemical formula of methacrylic acid is $C_4H_6O_2$, or $CH_2=C(CH_3)COOH$, which indicates the presence of 4 carbon atoms, 6 hydrogen atoms and 2 oxygen atoms.

224. The chemical structure of methacrylic acid shows the presence of the unsaturated carbon bonds:

Methacrylic acid



225. Fujii specifically discloses that the zinc or magnesium salt of methacrylic acid can be added to the golf ball in an amount between 15 to 50 parts, and more preferably between 35 to 45 parts. (Ex. EE, Fujii, page 462).

226. The Fujii reference discloses that the amount of unsaturated fatty acid can be added in an amount entirely within the '652 patent's claimed range. (Ex. EE, Fujii, page, 462).

227. Claim 1 of the '652 patent further requires the golf ball of its invention to contain about 0.05 to about 2 parts by weight of a sulfur compound selected from the group consisting of pentachlorothiophenol, 4-t-butyl-o-thiocresol, 4-t-butyl-p-thiocresol, 2-benzamidothiophenol, thiobenzoic acid, and zinc salts thereof.

228. Fujii discloses the addition of pentachlorothiophenol and zinc pentachlorothiophenol. (Ex. EE, Fujii, page 462). Fujii specifically discloses that zinc acids of pentachlorothiophenol are most favorably used and that the addition is normally in an amount of 0.1 to 1 parts. (Ex. EE, Fujii, page 463).

229. The embodiment described in the Fujii reference shows the addition of 0.3 parts of zinc pentachlorothiophenol, which is within the range claimed by the '652 patent. (Ex. EE, Fujii, at embodiment).

230. Claim 1 of the '652 patent further requires the addition of about 0.5 to about 3 parts by weight of an organic peroxide. The '652 patent specifically identifies dicumyl peroxide as a suitable organic peroxide. (Ex. D, '652 patent, col. 3, lines 3-6).

231. Fujii also discloses the addition of dicumyl peroxide. Fujii further discloses that the addition is in an amount of 0.5 to 5 parts. (Ex. EE, Fujii, page 462).

232. The embodiment described in the Fujii reference shows the addition of 1.1 parts of dicumyl peroxide, which is within the range claimed by the '652 patent. (Ex. EE, Fujii, at embodiment).

233. The Fujii reference discloses each and every limitation of claim 1 of the '652 patent.

234. The Fujii reference further shows that those skilled in the golf ball art in 1989 understood that the polymerization of polybutadiene could be mediated by a radical scavenger like PCTP, with beneficial effects on the performance of a golf ball core. As I describe below, the use of PCTP in the polymerization of polybutadiene was well known in the rubber art generally, and it is no surprise that those in the golf ball art, like Fujii, were also aware of it. The Fujii reference confirms this fact.

ii. Claims 3 and 5

235. Claim 3 of the '652 patent depends from claim 1 and further requires the golf ball core to be enclosed by a cover. Claim 5 depends from claim 3 and further requires an intermediate layer between the core and the cover.

236. Fujii discloses that the solid golf ball of his invention can be formed into "a spherical core of a one-piece or multi-layer ball" wherein "the core is enclosed by a cover material." (Ex. EE, Fujii, page 462).

237. It is my opinion, therefore, that the Fujii reference discloses each and every limitation of claims 3 and 5 of the '652 patent.

iii. Claims 6, 7 and 9

238. Claim 6 of the '652 patent depends from claim 1 and further requires the base rubber to be polybutadiene. Claim 7 depends from claim 6 and further requires the polybutadiene rubber to be a poly(1,4-butadiene) rubber containing at least 40 mol % of cis-1,4 bond. Claim 9 depends from claim 7 and further requires the base rubber to comprise at least 80% by weight of the poly(1,4-butadiene) rubber.

239. As discussed above, Fujii discloses that the base rubber of its invention can be made entirely of BR-01 rubber, which is a polybutadiene rubber, and more specifically a poly(1,4-butadiene) rubber having 90% cis 1,4 content. (Ex. EE, Fujii, page 461).

240. It is my opinion, therefore, that the Fujii reference discloses each and every limitation of claims 6, 7 and 9 of the '652 patent.

E. Opinion Regarding Invalidity of Claims 1, 5 and 9 as Obvious

241. I understand that even if a claim is not anticipated by the prior art, the claim may still be invalid if it is obvious in light of the prior art. When determining obviousness, more than one reference may be combined to invalidate the claim in question. When combining references, I understand that a motivation to combine the references must exist in the references themselves, or in light of the experience of one of ordinary skill in the art.

242. Further, when determining obviousness of a claim, I understand that secondary considerations also must be considered. I understand that the secondary considerations that have been raised by Bridgestone in this case include commercial success, copying, prior attempts and failures and obtaining unexpectedly better performance results.

243. It is my opinion that to the extent that any element of the asserted claims of the '652 patent is not fully disclosed in the Fujii reference, the '652 patent is still invalid based on obviousness.

1. Combination of Prior Art References

244. Claims 1, 5 and 9 of the '652 patent are obvious by the combination of any of: (a) Fujii Reference; (b) U.S. Patent No. 4,556,220 ("Tominaga '220"); (c) the Mastication of Rubber publication by H. Fries et al. ("Mastication of Rubber"); (d) U.S. Patent No. 4,722,977 ("Fischer '977"); and/or (e) the knowledge of those of ordinary skill in the art.

i. The Fujii Reference in Combination with the Knowledge of One of Ordinary Skill in the Art

245. The Fujii patent application is discussed fully above.

246. A person of ordinary skill in the art, possessed with the understandings and knowledge reflected in the prior art, including the Fujii Reference, and motivated by the general problem facing the inventors (*i.e.*, improving flight distance and durability), would have been led to make the combination recited in the asserted claims of the '652 patent.

247. Fujii discloses the use of BR-01 rubber as a suitable base rubber for the manufacture of golf balls. (Ex. EE, Fujii, at p. 462). BR-01 is a high cis 1,4-polybutadiene rubber. It was well known in the prior art that such rubbers were well-suited for the manufacture of solid golf balls. It was further well known in the prior art that the base rubber of golf balls could be manufactured entirely with such rubber.

248. Fujii further discloses the manufacture of solid multi-layer golf balls. (Ex. EE, Fujii, at p. 461-462). It was well known in the prior art that golf balls could be made with more than one cover layer. One of ordinary skill in the art would recognize that the golf ball disclosed in the Fujii reference could be made with an intermediate layer and an outer cover.

249. Fujii further discloses the addition of between 15 to 50 parts of a zinc or magnesium salt of an unsaturated fatty acid having 3 to 8 carbon atoms. (Ex. EE, Fujii, at 462). This range encompasses the entire range claimed by the '652 patent. It would have been a matter of routine optimization for one of ordinary skill in the art to select an amount of this component within the range claimed by the '652 patent. Moreover, it was well known in the prior art to use between 25 and 40 parts of an unsaturated fatty acid in golf balls.

250. Fujii further discloses the addition of between 0.5 parts and 5 parts of an organic peroxide, such as dicumyl peroxide. (Ex. EE, Fujii, at p. 462). The '652 patent claims a range of about 0.5 to about 3 parts of organic peroxide. It would have been a matter of routine optimization for one of ordinary skill in the art to select an amount of this component within the range claimed by the '652 patent. Moreover, it was well known in the prior art to use between 0.5 and 3 parts of an organic peroxide. The embodiment of the Fujii invention describes using 1.1 parts of organic peroxide. (Ex. EE, Fujii, at embodiment).

251. As such, it is my conclusion that, in addition to being anticipated as stated above, claims 1, 5 and 9 are also obvious in light of the Fujii reference and the knowledge of those of ordinary skill in the art.

ii. Tominaga '220 in Combination with The Mastication of Rubber Article and/or the Fischer '977 Patent

A. Disclosures of the Tominaga '220 Patent

252. U.S. Patent No. 4,556,220 to Tominaga ("Tominaga '220") (Ex. FF) issued December 3, 1985, based on an application filed June 7, 1984 claiming priority to a foreign application filed on June 10, 1983.

253. As Tominaga '220 issued as a patent more than one year before either the foreign filing date or the U.S. filing date of the '652 patent, I understand that it is prior art. I further understand that this is true regardless of whether the '652 patent is entitled to claim priority to its foreign filing date or not. I have reviewed the Tominaga '220 patent in light of claims 1, 3, 5, 6, 7 and 9 of the '652 patent.

254. A person of ordinary skill in the art, possessed with the understandings and knowledge reflected in the prior art, including Tominaga '220, and motivated by the

general problem facing the inventors (*i.e.*, improving flight distance and durability), would have been led to make the combination recited in the asserted claims of the '652 patent.

255. Tominaga '220 relates to a solid golf ball with excellent rebound performance, durability and flight carry characteristics produced from one or more agents for regulating the molecular weight of the grafted chain. (Ex. FF, Tominaga '220, at Abstract).

256. Tominaga '220 further relates to one-piece, two-piece and multi-piece solid golf balls. (Ex. FF, Tominaga '220, at col. 1, lines 5-10). Tominaga '220 discloses a two-piece golf ball comprising a solid core and a cover covering the core. (Ex. FF, Tominaga '220, at col.1, lines 6-7). Tominaga '220 further discloses a multi-piece golf ball having one or more suitable intermediate layers between the solid core and the cover. (Ex. FF, Tominaga '220, col. 1, lines 7-9).

257. Table 1 of the Tominaga '220 patent, reproduced below, discloses a core formulation that contains (a) 100% cis-1,4 polybutadiene; (b) 35 parts of zinc acrylate; (c) 1.5 parts of dicumyl peroxide; and (d) 0.5-0.9 parts of 2-(4-morpholinylthio)benzothiazole:

		TABLE I							
		Example			Comparative example				
		1	2	3	1	2	3	4	
Material of core	Cis 1,4-polybutadiene ⁽¹⁾	100	100	100	100	100	100	100	
	Zinc acrylate	35	40	43	30	35	40	40	
	Zinc oxide	53.1	52.7	52.3	54.5	53.7	52.8	52.7	
	Antioxidant ⁽²⁾	0.5	0.5	0.5	0.5	1.2	1.8	0.5	
	Dicumyl peroxide	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
	2-(4-morpholinylthio)benzothiazole	0.5	0.7	0.9	—	—	—	—	
	Sulfur	—	—	—	—	—	—	0.7	
Physical	Weight (g)	35.30	35.29	35.28	35.32	35.32	35.30	35.20	

TABLE 1-continued

		Example			Comparative example			
		1	2	3	1	2	3	4
property	Compression ⁽³⁾	48	50	52	51	50	50	128
of core	Rebound coefficient index ⁽⁴⁾	109	115	118	102	100	94	—
	Durability index ⁽⁵⁾	102	105	109	100	100	106	—
	Flight carry of two-piece solid golf ball (m)	209	210	213	207	206	204	—

⁽¹⁾BR-01: produced by Japan Synthetic Rubber Co., Ltd.

⁽²⁾2,2'-methylene bis(4-methyl-6-tert-butylphenol); produced by American Cyanamid Co., available as Antioxidant 2246

⁽³⁾The value, as expressed in 1/100 inch, of the amount of strain obtained when a definite load was applied after giving a definite initial strain.

⁽⁴⁾The relative value of rebound coefficient with the rebound coefficient of the core obtained in Comparative example 2 as 100.

⁽⁵⁾The relative value of impact resistance, as expressed by the number of applied impacts, with the impact resistance of the core obtained in Comparative Example 1 as 100.

258. Tominaga '220 patent teaches that polybutadiene is used alone as the base rubber or in combination with natural rubber, synthetic polyisoprene, and the like. (Ex. FF, Tominaga '220, at col. 2, lines 15-19). Table 1 of the Tominaga '220 patent includes rubber compositions with BR-01, which, according to Bridgestone's U.S. Patent No. 6,634,961 to Higuchi is a cis-1,4 polybutadiene commercially available from JSR Corporation that has 96 % cis-1,4 content. (See Ex. C, col. 10 lines 55-68; Table 1).

259. Table 1 of the Tominaga '220 patent also discloses that the golf balls of his invention have improved rebound performance, durability and flight carry characteristics. (Ex. FF, Tominaga '220, at Table 1). In summary:

'652 Claim 1 Requirements	Tominaga '220 Patent Disclosures Table 1
Base rubber selected from group, including polybutadiene rubber	100 % cis-1,4 polybutadiene
About 25 to about 40 parts by weight of zinc or magnesium salt of an unsaturated fatty acid having 3 – 8 carbon atoms	35 parts zinc acrylate
About 0.05 to about 2 parts by weight of a sulfur compound selected from the group consisting of pentachlorothiophenol, ...	0.5 to 0.9 parts of 2-(4-morpholinylthio)benzothiazole Sulfur compound, but not within the selected group.
About 0.5 to about 3 parts by weight of an organic peroxide	1.5 parts dicumyl peroxide

260. Tominaga '220 recognized that the moderate hardness and durability of prior art golf balls, as produced from a monomer such as the metallic salt of an α,β -

ethylenic unsaturated carboxylic acid, were due to the fact that the monomer is grafted to the polybutadiene main chain by the action of a free radical initiator, thereby acting as a co-crosslinking agent. (Ex. FF, Tominaga '220, col. 1, lines 19-25). But, when the grafted chain produced in this co-crosslinking became too long, a reduction in the rebound performance of the golf ball occurred. (Ex. FF, Tominaga '220, col. 1, lines 26-29).

261. The Tominaga '220 patent discloses the benefits of adding sulfur compounds to rubber used in the manufacture of golf balls to act as peptizers and regulate the molecular weight of the grafted chain, and thereby resolve the problem faced in the prior art. The Tominaga '220 patent specifically discloses a certain group of polysulfide type compounds that have a superior performance as an agent for regulating the molecular weight of the grafted chain. (Ex. FF, Tominaga '220, at Abstract; col. 1, lines 19-50).

262. During prosecution, the application that issued as the '652 patent was initially rejected as anticipated by Tominaga '220. (Ex. F, Office Action of 07/08/1991 at 2). From reviewing the prosecution history of the '652 patent, I understand that the '652 patent applicants were able to overcome the Examiner's rejection by narrowing the scope of their claims to encompass only certain sulfur compounds, other than the ones disclosed by Tominaga '220, including pentachlorothiophenol or PCTP. (See discussion of '652 prosecution history, above).

B. Disclosures of the Mastication of Rubber Article

263. The Mastication of Rubber article was published in a printed publication on November 11, 1981. (Ex. GG). As the Mastication of Rubber article was published in

a printed publication more than one year before either the foreign filing date or the U.S. filing date of the '652 patent, I understand that it is prior art to the '652 patent. I further understand that this is true regardless of whether the '652 patent is entitled to claim priority to its foreign filing date or not.

264. I have reviewed the Mastication of Rubber article in light of claims 1, 3, 5, 6, 7, and 9 of the '652 patent.

265. A person of ordinary skill in the art, possessed with the understandings and knowledge reflected in the prior art, including the Mastication of Rubber article, and motivated by the general problem facing the inventors (*i.e.*, improving flight distance and durability of golf balls), would have been led to make the combination recited in the asserted claims of the '652 patent.

266. The Mastication of Rubber article relates to the importance of regulating the molecular weight of rubbers, (including natural rubber, polybutadiene, polyisoprene and styrene butadiene), for processing.

267. The Mastication of Rubber article further discloses that in addition to decreasing the viscosity, mastication also accomplishes better rheological properties of rubber or rubber compounds. (Ex. GG, Mastication of Rubber article, p. 311).

268. The Mastication of Rubber article further discloses that thiophenols or aromatic disulfides can be used as radical acceptors to stabilize the free radicals of the chain fragments. (Ex. GG, Mastication of Rubber, p. 310).

269. The Mastication of Rubber article further discloses that zinc pentachlorothiophenol (Zn-PCTP) and activated pentachlorothiophenol (Act-PCTP) are

especially well-suited for this type of peptization. (Ex. GG, Mastication of Rubber, p. 314).

270. Table VIII of the Mastication of Rubber article, reproduced below, discloses that PCTP can be used for mastication of synthetic rubbers, including polybutadiene, styrene butadiene and polyisoprene.

TABLE VIII
DOSAGES AND PROCESSING TEMPERATURES FOR THE
MASTICATION OF SYNTHETIC RUBBERS WITH ACT. PCTP

Type of Rubber	Rubber temperature, °C	Act. PCTP, phr
SBR	130-150	2.0-1.0
OE/SBR	130-150	0.8-0.5
NBR	130-150	3.5-2.5
CR	80-110	3.0-2.5
BR	130-160	2.5-0.15
IR	80-150	0.5-0.15
IIR	100-170	0.8-0.15

271. In Table VIII of Mastication of Rubber article, SBR is the abbreviation for styrene butadiene. BR is the abbreviation for polybutadiene. IR is the abbreviation for polyisoprene. NBR is the abbreviation for natural rubber.

272. The Mastication of Rubber article further discloses the reaction sequence that can be expected by adding PCTP to the rubbers identified in Table VIII. Specifically, the article states that "free radicals formed in chain cleavage (e.g., in SBR and NBR) show a low affinity for oxygen. The peptizing agent has a stabilizing effect on free radicals so that they cannot cause branching at the polymer chain." (Ex. GG, Mastication of Rubber, p. 326).

273. The Mastication of Rubber article was authored by H. Fries and R. R. Pandit of Bayer AG. I understand from discussions with Dr. David Felker that Bayer AG was a primary manufacturer of rubber for the golf ball industry, and that it is likely, therefore, that one of ordinary skill in the golf ball industry would have been aware of this article on the Mastication of Rubber by Bayer AG.

C. Disclosures of the Fischer '977 Patent

274. U.S. Patent No. 4,722,977 to Fischer ("Fischer '977") (Ex. II) issued February 2, 1988, based on an application filed January 16, 1985, claiming priority to a foreign application filed on January 26, 1984.

275. As Fischer '977 issued as a patent more than one year before either the foreign filing date or the U.S. filing date of the '652 patent, I understand that it is prior art to the '652 patent. I further understand that this is true regardless of whether the '652 patent is entitled to claim priority to its foreign filing date or not.

276. I have reviewed the Fischer '977 patent in light of claims 1, 3, 5, 6, 7, and 9 of the '652 patent.

277. A person of ordinary skill in the art, possessed with the understandings and knowledge reflected in the prior art, including Fischer '977, and motivated by the general problem facing the inventors (*i.e.*, improving flight distance and durability of golf balls), would have been led to make the combination recited in the asserted claims of the '652 patent.

278. The Fischer '977 patent discloses the use of sulfur compounds, including PCTP, in rubber compositions. The Fischer '977 patent teaches useful peptiser-booster combinations for use with natural and synthetic rubber compositions that result in improved vulcanized rubber products. (Ex. II, Fischer '977, at col. 2, lines 2-7). In particular, the peptiser-booster combinations include peptisers such as "salts of higher carboxylic acids, e.g., pentachlorothiophenol." (Ex. II, Fischer '977, at col. 2, lines 36-42).

279. Fischer '977 further discloses that the peptisation boosters of the present invention (*i.e.*, pentachlorothiophenol) can be used in synthetic rubbers such as cis-polybutadiene and cis-polyisoprene. (Ex. II, Fischer '977, col. 4, lines 38-42).

280. The Fisher '977 patent discloses pentachlorothiophenol for use in rubber compositions to not only improve the mastication efficiency, but also improve the resulting vulcanized product. (Ex. II, Fischer '977, at col. 2, lines 37-42).

281. The Fischer '977 patent is directly applicable to golf balls. Just like the Mastication of Rubber article, the '977 patent comes from Bayer AG. Because Bayer was so prevalent in the rubber industry for golf balls, it is my opinion that a skilled artisan looking to improve on a golf ball core formulation would have been aware of the Fischer '977 patent.

**D. Tominaga '220 in Combination with The
Mastication of Rubber Article and/or the Fischer
'977 Patent Make the Asserted Claims of the
'652 Patent Obvious**

282. As discussed above, the Tominaga '220 patent discloses a golf ball with all of the limitations of the asserted claims of the '652 patent except that it identifies a different sulfur compound than that listed in claim 1. Specifically, the golf ball disclosed in Tominaga discloses the use of 2-(4-morpholinyldithio)benzothiazole, which is a sulfur compound, but not one of the specific sulfur compounds listed in the '652 patent.

283. During prosecution of the '652 patent application, the inventors overcame an anticipation rejection based on the Tominaga '220 patent by arguing the necessity of the specific sulfur compounds listed in the '652 patent, such as pentachlorothiophenol, because they resulted in "unexpectedly superior" improvement in performance, hardness

and durability, and were previously not known to be useful in golf balls. (See discussion of '652 patent prosecution history, above, and Ex. F)

284. Tominaga '220 recognized the advantages of adding a sulfur compound to the base rubber used in making golf balls to act as a peptizing agent. It just failed to explicitly disclose the use of the specific sulfur compounds claimed by the '652 patent.

285. The Mastication of Rubber Article and the Fischer '977 patent, however, both show that pentachlorothiophenol was known to be a well-suited peptizing agent or radical scavenger in the mastication of synthetic rubbers, such as polybutadiene. Based on the disclosures contained in either or both of these references, one of ordinary skill in the art would have known at the time the '652 patent application was filed (or its foreign application) that pentachlorothiophenol would be a suitable sulfur compound to add to rubber compositions of golf balls.

286. Therefore, by combining the disclosures made in the Tominaga '220 patent with the knowledge obtained from the disclosures of either or both the Mastication of Rubber article or the Fischer '977 patent, one of ordinary skill in the art would find the asserted claims of the '652 patent to be obvious.

287. Even if the '652 patent is entitled to rely on its foreign priority date, and the Fujii Reference is not therefore prior art to the '652 patent, it is still highly probative as to what one of ordinary skill in the art would know at the time the '652 application was filed.

288. The Fujii Reference further shows that one of ordinary skill in the art at the time the '652 patent application was filed already knew of the advantages of using pentachlorothiophenol in the base rubber used to make golf balls.

289. Therefore, it is my opinion that one of ordinary skill in the art would be motivated to combine the disclosures of Tominaga '220 with either or both of the Mastication of Rubber article and the Fischer '977 patent.

290. It is my further opinion that such a combination would make the asserted claims of the '652 patent obvious.

iii. Fujii Reference in Combination with Tominaga '220

291. The Fujii Reference and the Tominaga '220 Patent are both directed to the specific field of golf balls. Both also relate to improving the internal core of one-piece and multi-piece golf balls, such that the flight carry characteristics, rebound properties and durability properties of the golf ball are improved. (Ex. EE, Fujii Reference, page 461: "The present invention was developed ... to provide solid golf balls that not only exhibit desirable flight properties but excel in impact properties and durability."; Tominaga '220, Abstract: "The present invention provides solid golf balls having excellent rebound performance, durability and flight carry characteristics...").

292. Therefore, it is my opinion that one of ordinary skill in the art would have been motivated to combine the Fujii Reference with the Tominaga '220 Patent.

293. It is my further opinion that such a combination would make the asserted claims of the '652 patent obvious. The Fujii Reference discloses the addition of pentachlorothiophenol as one of the sulfur compounds that can be added to the base rubber of golf balls and Tominaga '220 discloses all other elements of the asserted claims.

IX. SECONDARY CONSIDERATIONS

294. It is my understanding that a patent holder may rely on objective indicia of non-obviousness, known as secondary considerations, to try and preserve the validity of its patents. In forming my opinion regarding the asserted claims of the '961 and '652 patents, I have considered whether any of these secondary considerations are present.

295. I have reviewed Bridgestone's Ninth Supplemental Response to Acushnet's Interrogatory No. 10. (Ex. L). In that response, Bridgestone generally contends that all of its asserted patents, including the '961 and '652, are non-obvious for the following reasons: (a) the alleged inventions led to unexpectedly better performance results; (b) Acushnet copied Bridgestone's technology; and (c) Acushnet's golf balls were commercially successful. In addition, Bridgestone specifically asserts that the '652 is non-obvious because of Acushnet's failure to produce golf balls with 2 layer covers and because of the commercial success of the invention claimed in the '652 patent.

296. It is my understanding that for objective indicia of non-obviousness to be significant there must be a connection or nexus between the claimed features of the invention and the particular secondary consideration. In its interrogatory response, Bridgestone did not describe or explain a connection between any objective indicia of non-obviousness and the '961 and '652 patents.

297. For example, Bridgestone does not explain how the commercial success of any Bridgestone or Acushnet golf ball was the result of a claimed feature of either the '961 or '652 patent.

298. It is my opinion that there can be no nexus between the asserted claims of the '961 and '652 patents and the commercial success of Acushnet's current products if Acushnet does not infringe any asserted claim of either patent. The fact that the Pro-V1

was in public use and on sale before Bridgestone filed the '961 application is further evidence that the golf ball's commercial success cannot be attributed to the claimed invention. Both of these facts are also evidence that Acushnet could not have copied the asserted claims.

299. Bridgestone's Interrogatory response also does not describe or explain how Acushnet's failure to produce golf balls with 2-layer covers related in any way to a failure to use the claimed features of the '652 patent. Nor does Bridgestone describe any nexus between the performance of its golf balls and the claimed features of either the '652 or '961 patent.

300. In the absence of any explanation of how the secondary considerations are related to the features of the '961 and '652 patents, I cannot give Bridgestone's assertions any significant weight. Also, in connection with the '652 patent, the elements of the asserted claims were so widely known in the prior art that such evidence would not change my opinion regarding the '652 patent.

301. As such, it is my conclusion that the asserted claims of the '652 and '961 patents are obvious for the reasons set forth above.

X. GRADIENTS

302. Gradients in rubber have necessarily existed from the first time rubber articles were fabricated over a hundred years ago. In short, a gradient is an inherent quality of rubber that one of ordinary skill in the golf ball art in 1995 would understand.

303. When rubber articles, like golf balls, are fabricated, the uncrosslinked rubber and other ingredients such as fillers, crosslinking agents, etc., are mixed together and inserted into a mold.

304. The mold is held at the cure temperature, which depends on the decomposition temperature of the crosslinking agent, i.e., a peroxide. The surface of the rubber, which would be in contact with the walls of the mold, will be exposed to an elevated temperature, i.e. the temperature required to decompose the peroxide into free radicals required to cure (crosslink) the rubber.

305. Because rubber is a thermal insulator, it has a low capacity to conduct temperature. As a result, a thermal gradient in the rubber is developed, in which the surface in contact with the mold is at a higher temperature than the interior parts of the rubber.

306. As a consequence, the curing will begin at the surface immediately, but will not begin at the core until the core reaches a sufficiently high temperature to decompose its crosslinking agent.

307. In other words, the rate of the curing reaction is a function of temperature, i.e. the higher the temperature the faster the kinetic reaction of curing. Because the core is at a lower temperature than the surface, the curing reaction at the core is slower than at the surface. Therefore there is a gradient in the degree of cure in the molded rubber article from the surface to the center.

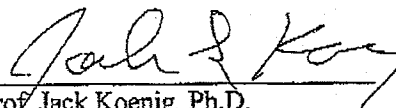
308. This will produce a gradient hardness in the physical and mechanical properties of the rubber from the center to the surface. Thus, for a golf ball, there will always be a gradient in hardness and other physical and mechanical properties from the core to the surface with the surface being higher. This gradient will be greater when the mold temperature is higher and the thickness of the rubber article is large, i.e. like a golf ball.

XI. CONCLUSION

309. I reserve the right to supplement this report should new information come to light that bears on my opinions contained in this report. I reserve the right to supplement or modify this report, if appropriate, to the extent that new or additional information is provided. I also reserve the right to consider and comment on additional evidence that may be presented by experts for Bridgestone.

310. At trial or any hearing in this litigation, I may provide demonstrative aids, such as computer animations, excerpts from relevant exhibits, deposition testimony, and physical examples, to assist in explaining the subject matter discussed in this report.

Signed this sixteenth day of January, 2007.


Prof. Jack Koenig, Ph.D.